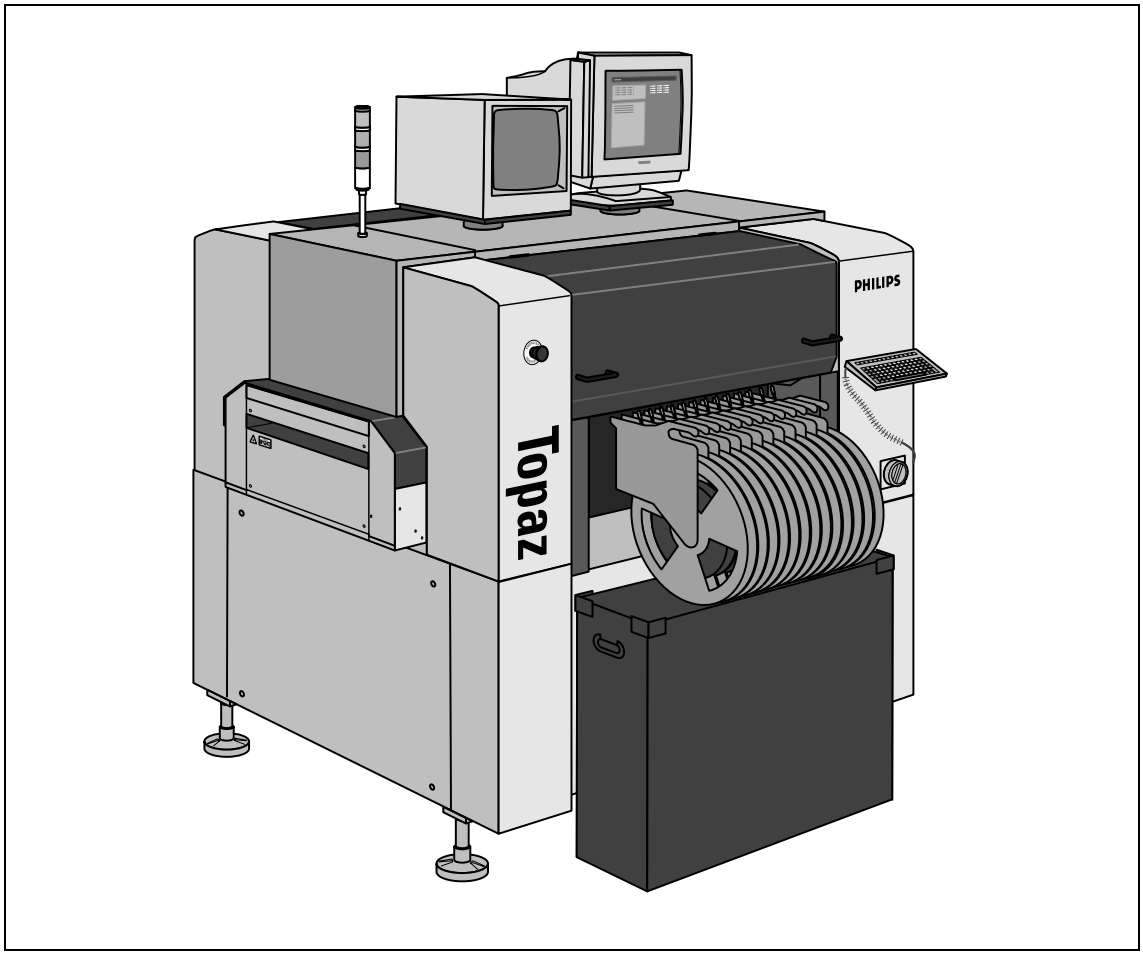
PA 1309/10

Topaz



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SAFETY

General:

For the correct and safe use of the CSM system, it is essential that both **OPERATING and SERVICE** personnel follow generally accepted safety procedures in addition to the safety precautions specified in these safety and quick reference cards. The operating, service and installation manuals have warning and cautionary statements throughout the whole manuals where applicable. Warnings and cautionary statements and/or symbols are present on the system where applicable.

Cautions and marks:

REFERENCE

Gives useful information related to the mounter operation.

NOTE

Explains the mounter operation and procedures in a simple and clear manner.

CAUTION

Gives important information to prevent any damage to the mounter or data.

WARNING

Gives information of utmost importance in ensuring the safety of the mounter operator, inspector, or service personnel.

EMERGENC BUTTON

Press the emergency button.

REMARK

Gives a comment.

Training level personnel:

Operation, adjustment, maintenance and repair of the CSM system may only be carried out by **qualified and trained** personnel who are aware of the hazards involved.

The following training levels are defined:

- Operator level: Official Philips training course or training received by a qualified maintenance engineer.
- User or Supervisor level: Official Philips training at one of the official Philips Training Centres.
- Maintenance or Service level: Official Philips training at one of the official Philips Training Centres.

Safety standards:

The safety standard of the CSM system is in accordance with CE directives:

- Machine directive 89/392/EEC and 91/368/EEC.
- Low Voltage directive 73/23/EEC.
- EMC directive 89/336/EEC.

Liability:

Philips shall not be liable for any costs, damages or personal injuries if the CSM system is not used according to the safety rules given in this paragraph.

Detailed information:

For more detailed information how to operate and to maintain the CSM machine please refer to the Operating and Service manuals of this system.

Location of the Operator manual:

The Operator manual MUST BE LOCATED CLOSE to the CSM machine. This enables operators to have easy access to the relevant cards.

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Philips Electronic Manufacturing Technology

Supply Centre Customer Support
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The Netherlands

Service Manual Topaz

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CHAPTER 1 Introduction

1.1. General Introduction

The service manual describes electrical, mechanical, software and pneumatic aspects of the GEM Topaz system. The repair philosophy of the electric part of the machine is based on PCB swapping and not on component level replacement, Therefore only a functional description of each PCB will be given in this manual.

WARNING

Only technical personnel which is trained on the Topaz equipment is allowed to carry out service actions.

1.2. Chapter Overview

This chapter provides a brief description of the contents of each chapter of this manual.

Chapter 1 **Introduction**

Chapter 2 **General block diagram**
This chapter shows the electrical block diagram of the machine.

Chapter 3 **Systems principles**
This chapter explains the electrical principles of the various circuits and the general adjustment methods.

Chapter 4 **Power and safety circuits.**
This chapter describes the power and safety circuits.

Chapter 5 **Vacuum and pneumatic systems**
This chapter describes the air and vacuum/pneumatic systems.

Chapter 6 **PCB transport systems**
This chapter explains the PCB transport and fixation systems like conveyor, push-up, push-in, edge clamp, main-stopper, locate-pin, etc.

Chapter 7 **Component transport systems**
This chapter explains the items of the Topaz that takes care of the transportation of the component. Like, head assy, nozzle station, feeder-plates, feeders, etc.

Chapter 8 **Axes systems**
This chapter explains the function and adjustment of the X, Y, R, Z, and W axis systems of the Topaz.

Chapter 9 **Vision systems**
This chapter explains the function and adjustments of the two vision systems used in the Topaz.

Chapter 10 **Software section.**
This chapter explains the machine operating software (VIOS), the PCB file structure and machine configuration screens.

Chapter 11 **Machine Installation and Calibration**
This chapter explains the machine installation procedure and explains adjustment and calibration of the Topaz in order to obtain placement results within the given specifications.

Chapter 12 **Maintenance**
This chapter describes inspection periods and procedures for daily and periodic inspections that should be performed. The inspection lists are explained according to each inspection location and period. Beside the maintenance procedures also an overview of error messages in the VIOS software is given.

Chapter 13 **Spare parts lists**
This chapter gives an over view of spare parts defined for this machine.

Chapter 14 **Drawings and circuit diagrams**
This chapter shows the most important electrical and air-circuit diagrams.

Chapter 15 **Main index**
This chapter shows the main index of this service manual.

Chapter 16 **Options**
This chapter describes all major options available for the Topaz.

Chapter 17 **Appendix 1**
This chapter encloses the Material Safety Data Sheets of the oils and greases used in the Topaz.

1.3. Safety

1.3.1. General

Please observe all safety rules and cautionary remarks to ensure that the machine is used in a safe and correct matter. Also please bear in mind that not all safety items can be listed in detail, so that an accurate judgment by the service engineer is essential in servicing the machine safely.

1.3.2. Basic Rules

The following are basic safety rules which must be observed:

1. The person who's servicing the machine must have received proper training to operate service the machine in a safe and correct manner.

2. The power supply must be turned OFF whenever the machine is inspected, parts are replaced, or internal adjustments are made.

3. During operation of the machine, be sure to keep all parts of the body, such as the hands or head, away from the machine's moving parts.

4. Be sure to keep the HHK (Hand Held Keyboard) in your hand whenever "teaching" or making adjustments to the machine, so that it can be stopped at any time.

5. Be sure the "interlock" safety devices are maintained in an operable condition so that it can be used to stop the machine at any time.

6. Do not use the machine in an environment where flammable gasses are present or where it is extremely dirty.

1.3.3. Safety Standards

The safety of the CSM/GEM systems is in accordance with following CE directives:

Machine directive 89/392/EEC and 91/368/EEC including amendments.

Low Voltage directive 73/23/EEC including amendments.

EMC directive 89/336/EEC including amendments.

1.3.4. Cautionary Remarks

This Manual uses the following cautionary remarks:

REFERENCE:
Gives useful information related to the machine operation.

NOTE:
Explains the machine operations and procedures in a simple and clear manner.

CAUTION:
Gives important information to prevent any damage to the machine or data.

WARNING:
Gives information of utmost importance in ensuring the safety of the operator or service personnel.

EMERGENCY BUTTON:
Indicates to press first the emergency button before continue.

1.3.5. Warning Stickers

This paragraph gives an overview of warning stickers that are used to warn the operators and service people for dangerous situations. With every picture a short description is given of that dangerous situation.

Do not enter

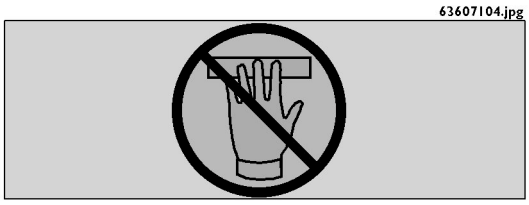

Figure 1-1 Do not enter

This sticker warns the operator/service engineer not to enter by hand.
It is located at the entrance and exit conveyor rail.

Electrical shock

63607102.jpg

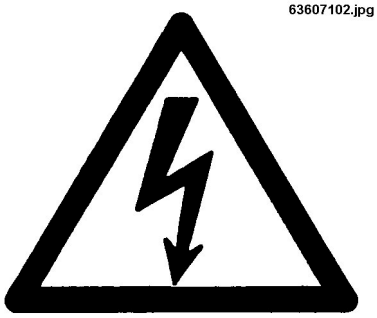

Figure 1-2 Electrical shock

This sticker, see figure 1-2, warns the operator/service engineer for electrical shock.
Behind the covers are high electrical voltages present.

Low Radiation

63607101.jpg

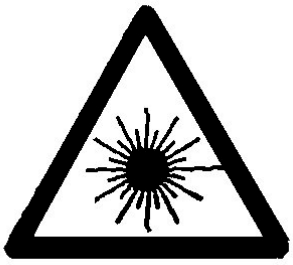

Figure 1-3 Radiation

This sticker, see figure 1-3, warns the operator/service engineer for low radiation.
This sticker is located nearby the laser transmitter for feeder floating detection.

High temperature

63607103.JPG

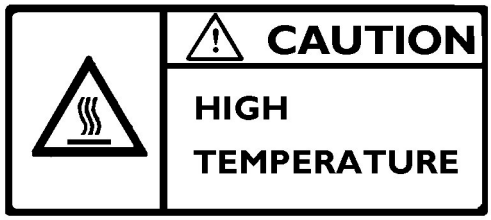

Figure 1-4 High temperature

This sticker, see figure 1-4, warns the operator/service engineer for high temperature presence. This sticker is located upon the Y-motor of the Topaz.

1.3.6. ESD Precaution

All printed circuit boards that are part of the CSM/GEM machines must be transported and stored in ESD-protected bags.

Any person handling an CSM/GEM printed circuit board must adequately be earthed - e.g. by means of a bracelet with earth cable - to prevent destructive electrostatic discharge through the printed circuit board.

In areas that are not ESD protected, the removable protective covers must be mounted on all placement modules.

Handling of printed circuit boards should be restricted as much as possible.

1.3.7. Noise Level

The average noise level of the Topaz system during production is < 72 dB. (A)

1.3.8. Liability

Philips shall not be liable for any costs, damages or personal injuries if the CSM/GEM system is not used according to the safety rules given in this manual.

1.3.9. Oil and Greases

This section gives more detailed information about oils and greases used in the Topaz.

In chapter 12 a compatibility list with a number of greases that can be used is given.

Following greases and oils are covered:

12NC no.	Supplier	Trade name	General description	MSDS no.
5322 390 20159	NSK	NSK 1 grease Multitemp CRL No3	Grease	07-230
5322 390 20161	NSK	NSK 2 grease Multitemp PS No2	Grease	07-300
5322 390 20155		Molub alloy	Grease	
-	AccTech	HP-Alco pad	Cleaning tissues	806H-806
5322 390 10144	Ausimont	Fomblin Y-VAC3	Vacuum grease O-rings and seals	12298
-	Shell	Alvania grease 2	Grease	56110-08
-	Du Pont	Krytox GPL-22X GPL-52X	Vacuum grease O-rings and seals	DU008134

Table 1-1

Note:

Philips will not be responsible for any damage to the machine if other greases and/or oils are used than mentioned above.

1.3.10. Abbreviations

This chapter describes common used abbreviations in this manual in alphabetic sequence.

Abbreviation	Explanation
A	Ampere
AC	Alternating current
ASAP	As Soon As Possible
ATS	Auto Tray Stacker, tray handling device
B/W	Black and white
BGA	Ball Grid Array
CE	Comité europièn
CN	Connector
COB	Chip on board
COG	Centre Of Gravity
CPU	Central processing unit
CS	Customer Support
CSM	Compact Surface Mounter
CSP	Chip scale package, •BGA

Abbreviation	Explanation
DC	Direct current
DI	Document Information
DI	Data Input
DO	Data Output
DIL	Dual In Line, chip package
EMG	Emergency
ESD	Electro Static Discharge
FD	Floppy Disk
FES	Feeder exchange system
FV	Full Vision
GDI	Good
GEM	Product line : Topaz, Emerald and Sapphire
H.H.K.	Hand Held Keyboard
HDD	Hard Disk Drive
HDLC	High Level Data Link Control; More extensive communication protocol than SDLC
IM	Installation Manual
ISO	International Standard Organization
LCS	Large Component Sequencer, Also called trayfeeder.
MTF	Manual Tray Feeder
OM	Operator Manual
PI	Priority 1 indicator,
PA	Philips Article
PCP	Product Creation Process
PCS	Philips Consumer Services, worldwide stock for EMT
QFP	Quad Flat Package
SI	Service Information
SDLC	Serial Data Link Control; communication protocol with one clock and data line.
SM	Service Manual
SOP	Single Outline Package,
SVS	Setup Verification System
TBD	To be defined
TBW	To Be Written
TC	Tray Changer, Tray handling device
TI	Technical Information
TPD	Technical Product Documentation
TSOP	Top Single Outline Package,
UFOS	User Friendly operating System
UM	User Manual
UP	Under Progress
URS	User Requirement Specification
VIOS	Vision Integrated Operating System

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CHAPTER 2 General and Electrical Block Diagram

This chapter shows both general and electrical block diagrams of the Topaz.

The general block diagram, figure 2-1, shows the main sections of the Topaz. References are made to the chapters in this manual.

The electrical block diagram, figure 2-2, shows an overview of the main electrical parts of the system.

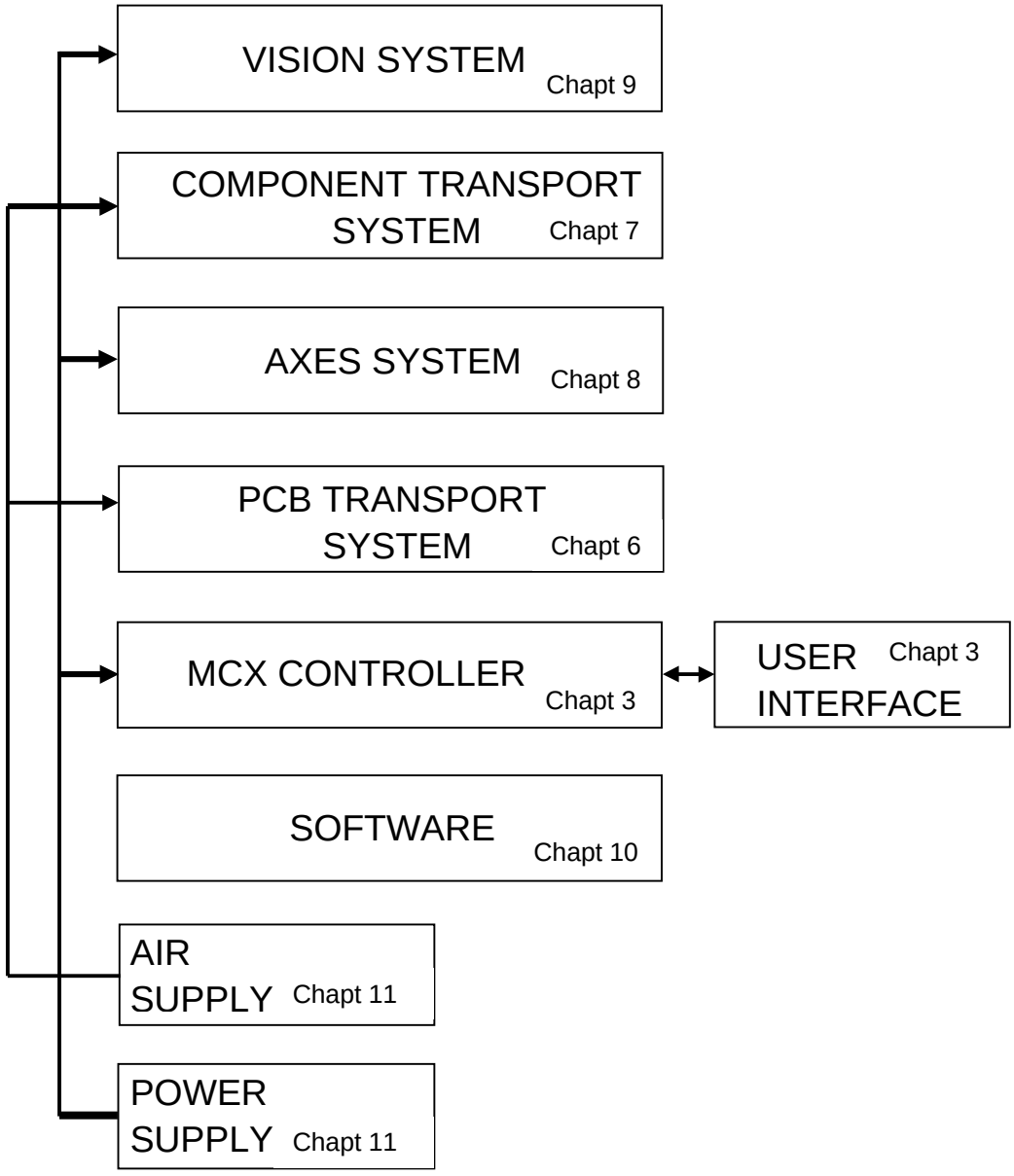

Figure 2-1 General block diagram Topaz

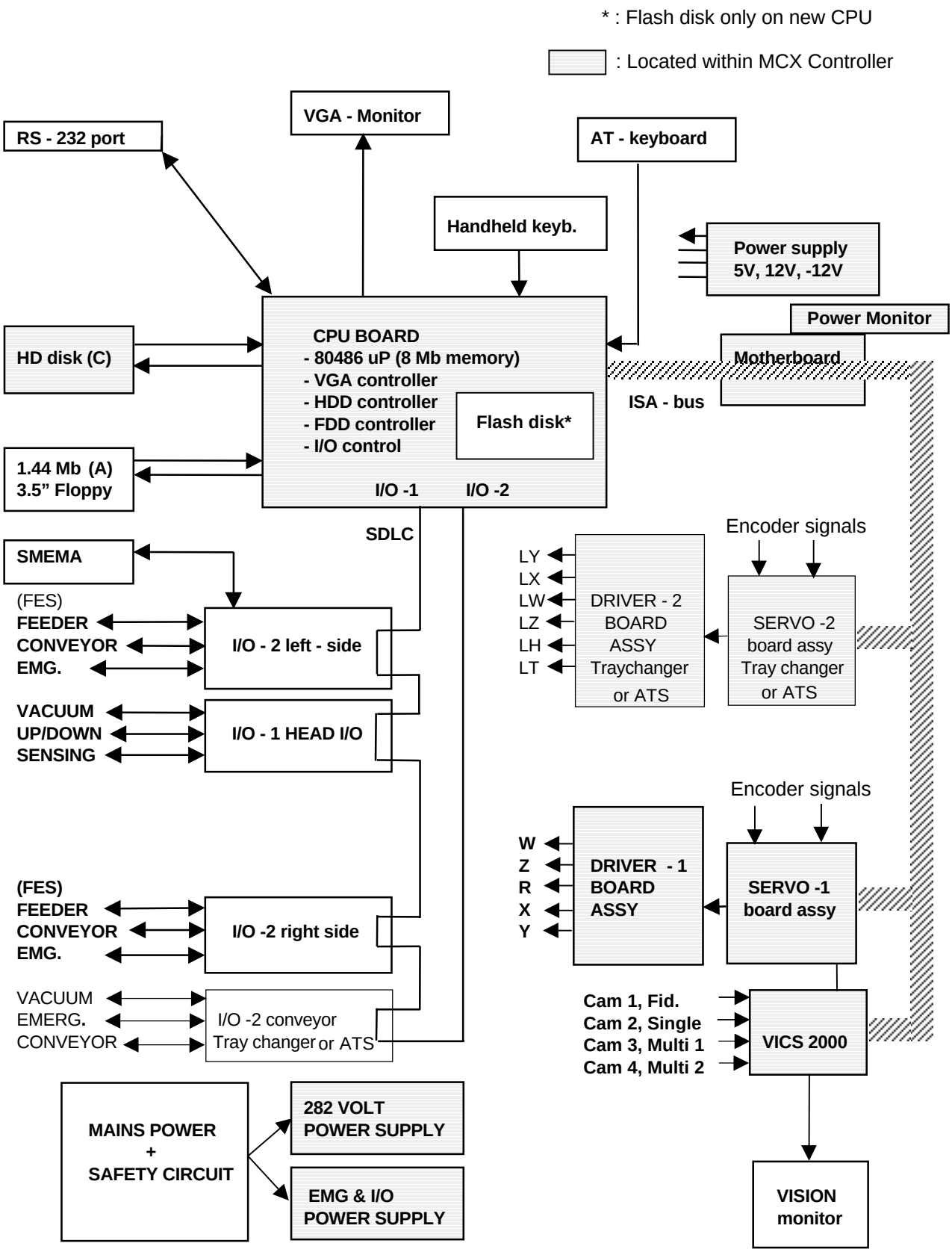

Figure 2-2 Electrical block diagram Topaz

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CHAPTER 3 System Principles

3.1. Introduction

This chapter describes all the installation and the basic system principles of the TOPAZ.

The first part of this chapter describes the Mains, Air and system installation specifications. The second part discusses the Control unit MCX with the related PCB's, the third part gives a overview of the various I/O PCB's, Key-boards and monitors. The last part covers the I/O signals and a brief introduction how to use the various adjustment commands (adjustment methods) when doing a machine adjustment.

3.2. Mains Specifications and Connection Schedule

The Topaz must be connected to a three phase Mains power system. The Topaz has the following specifications:

AC Voltage selection:	200/208/220/240/380/400/416 V AC +/- 10%,
Frequency:	50/60Hz.
Power rating	4KVA max.
Voltage interruptions	Not longer then 6 mS.
Voltage drops	Not higher than 15% and not longer then 0.5 Sec.

The mains has to be connected with 3 cables with 2.5 mm^2 to the terminal block XB11. Always connect a ground wire of 2.5 mm^2 to the ground terminal M4 (PE).

The Mains transformers must be configured according to the supplied Mains voltage level. The tap settings on the two transformers TC11 and TM11 must be configured according to the schedule given in figure 3.2-1. In every system the transformer tap-setting schedule can be found at the in-side of the power-box door.

WARNING

When connecting the MAINS power, make sure to configure the Mains transformers before. When changing the Mains input voltage, always check first with the Philips service centre. Make sure to take all necessary precautions to avoid dangerous situations.

NOTE:

For the power connection to the system please refer to "Machine installation: Power connection" in section 11.2.9. For the transformer power tabs see section 11.2.7 as well.

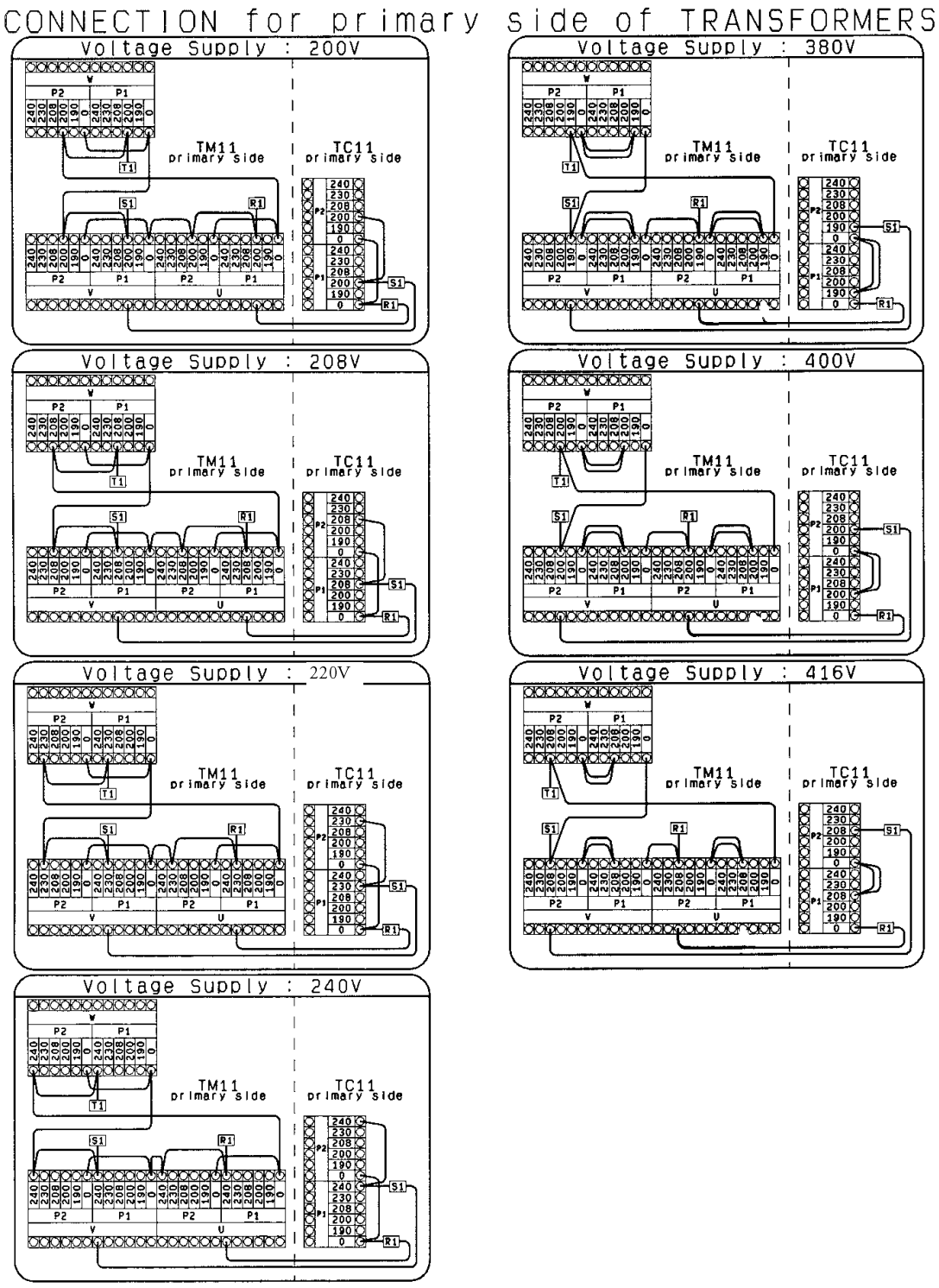


Figure 3.2- 1 Tap settings of the mains transformers

In figure 3.2-2 the circuit breaker box is shown (with removed front cover). This box locates all the circuit breakers of the Topaz system. Below a list is given of all the circuit breakers functions.

QF11:	13A	Mains circuit breaker
QF21:	2A	Monitors (VGA + Vision monitors)
QF22:	5A	Controller box and power supply GS21
QF31:	10A	Motor drivers
QF32:	2A	Conveyor motors

XB11: Mains input terminal.

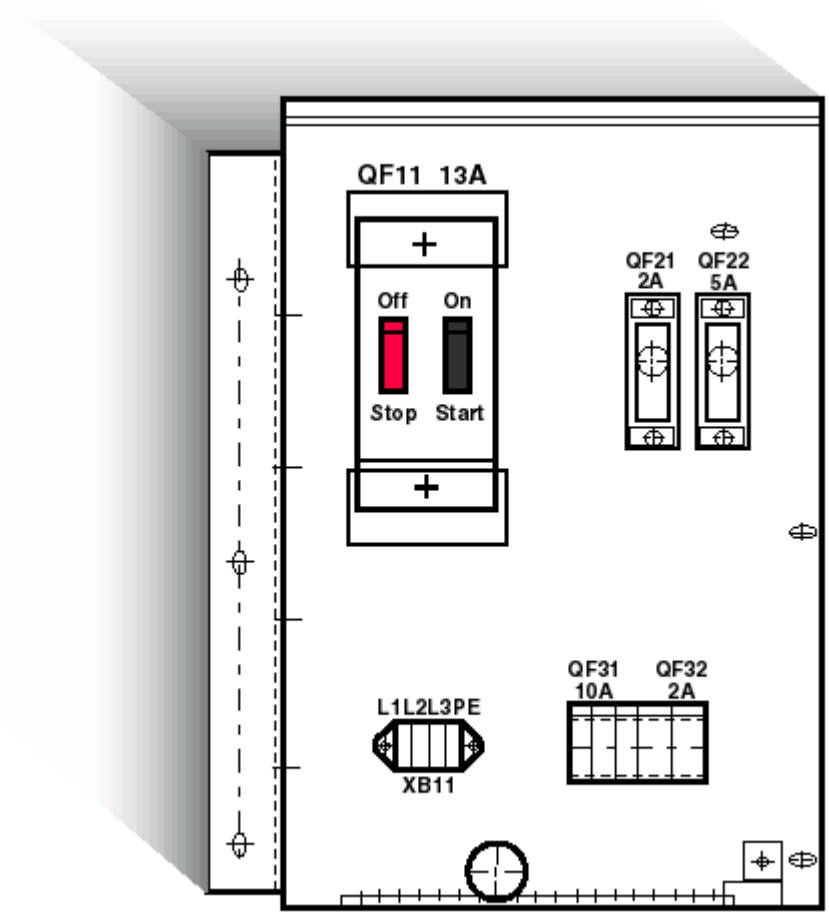


Figure 3.2-2 Circuit breaker box (with removed cover)

3.3. Air Specifications and Connection

The air supply of the Topaz must fulfill the following requirements:

• Pressure:	6.0 – 7.0 bar	(88 - 102 psi)
• Flow:	350 Nl/min	(12.4 CFM)
• Oil content:	< 0.1 mg/m^3	
• Dew point:	< 2°C at 7 bar	(35°F at 101 psi)
	< 4°C at 7.2 bar	(40°F at 105 psi)

An air supply of 6.0 – 7.0 bar must be connected to the system via a 1/2" ID hose (3/8 inch minimum) suitable for high pressure.

The air must remain within the above specifications. Otherwise increased frequency of some maintenance actions or damage to the machine will occur.

For the air supply connection to the system please refer to the air circuit diagram in chapter 14 and to "Machine installation: Air connection" in section 11.2.8.

3.4. Interfaces

There are 4 general interfaces between the various parts of the machine and between the machine and the out-side world. The inside interfaces are: SDLC (Synchronous Data Link Control) and ISA-bus. The outside interfaces are: RS232 serial interface, Centronics parallel interface, SMEMA and Gate-in/Gate-out interface.

3.4.1. Bus Definitions

ISA-bus
The used bus structure which connects the various PCB's inside the controller is the standard ISA (International Standard Architecture) bus.

SDLC link
The communication between the System board and the I/O boards (front/rear/tray changer) is done via the SDLC link. With this bi-directional synchronous link the data/clock is serially transported to the I/O boards. The information sent via this link contains address information followed by data information. Each I/O board has its own unique address. After sending an address it will be decoded by the I/O PCB circuitry an if there is a match the I/O PCB in question will take over (or send) the data information.

There are 2 wires for the data signals and 2 wires for the clock signal. The two wires are needed for each signal because the signals are sent via bus-transmitters/receivers (low voltages) to reduce the influence of noise signals.

As can be seen from the block diagram, the signals are fed to the first I/O board and, via a receive/transmit circuitry, past on to the next I/O board. This means that a defect in the receive/transmit circuitry on the first I/O board can cause troubles on the next I/O boards in the chain. This can be important for the chain where the LCS is connected (I/O-2), this because the traychanger is connected between the front head I/O board and the front conveyor I/O board. To over-come possible problems it is possible to interconnect the I/O-2 signal line between the front head I/O and front conveyor I/O in the machine.

HDLC link
The HDLC link protocol is similar to the SDLC but only used in the third generation boards.

3.4.2. Serial Interface

Two RS232 interface ports are present on the Topaz. CMN1 is used for the hand-held keyboard while CMN2 is used for the connection between the system board and an external PC system. The meaning of the RS232 connector pins is shown in table 3.4-1.

Figure 3.4-1 shows some examples of connections related to the DTE (Data terminal Equipment; computer) and the DCE (Data Communication Equipment; modem).

Pin. Nr.	Name	Meaning	Input/output
2	TXD	Transmit data	Output from mounter
3	RXD	Receive data	Input to mounter
4	RTS	Request to send	Output from mounter
5	CTS	Clear to send	Input to mounter
6	DSR	Data set ready	Input to mounter
7	GND	Signal ground	-
8	DCD	Data carrier detected	Input to mounter
20	DTR	Data transmission ready	Output from mounter

Table 3.4-1 RS-232 Connections

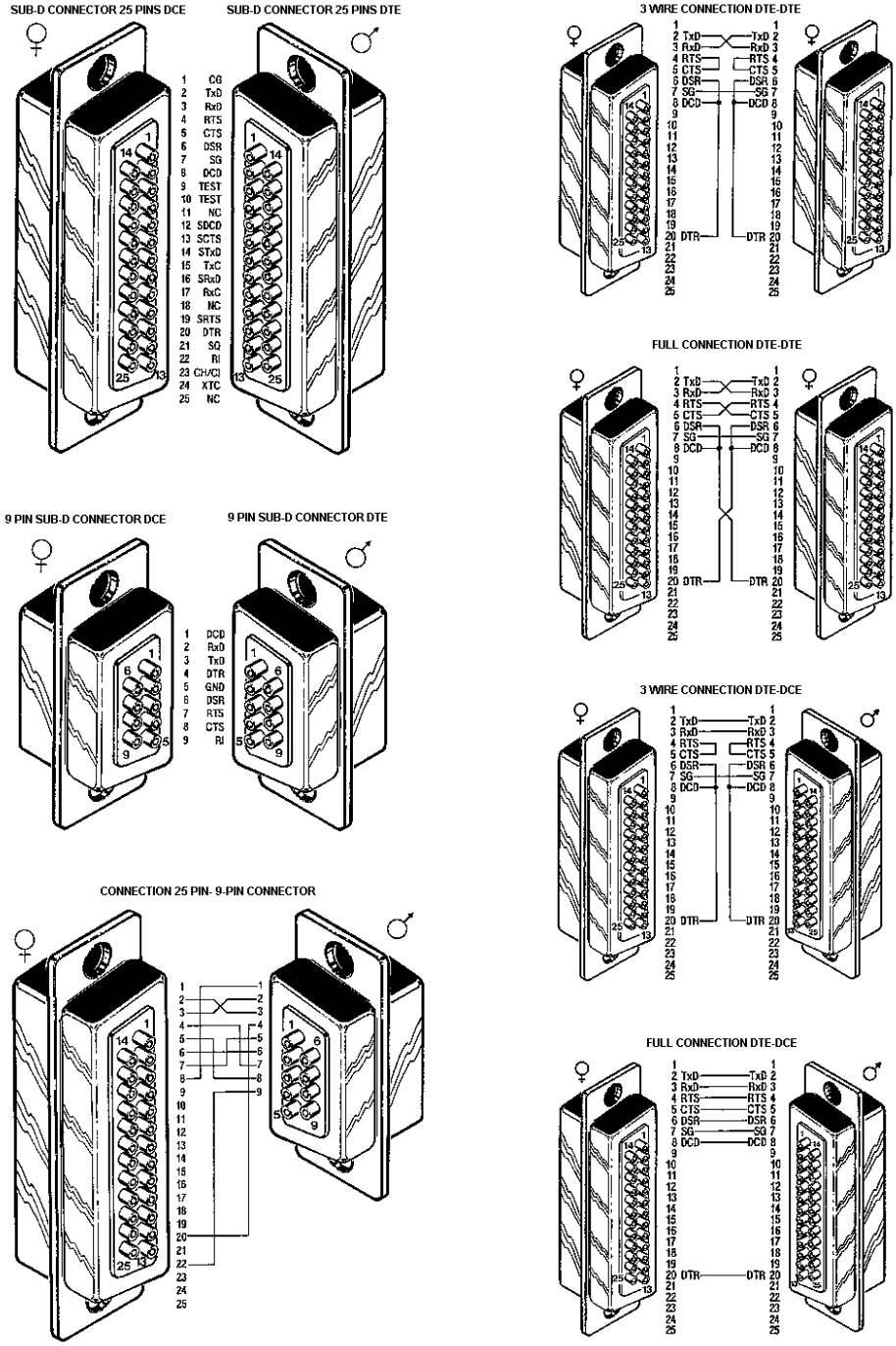

SUB-D CONNECTOR 25 PINS DCE
SUB-D CONNECTOR 25 PINS DTE
3 WIRE CONNECTION DTE-DTE
FULL CONNECTION DTE-DTE
9 PIN SUB-D CONNECTOR DCE
9 PIN SUB-D CONNECTOR DTE
3 WIRE CONNECTION DTE-DCE
CONNECTION 25 PIN- 9-PIN CONNECTOR
FULL CONNECTION DTE-DCE

Figure 3.4-1 RS-232 Connections

3.4.3. Line Interconnections

There are two methods which can be used to interconnect two or more systems in a line, the GATE-IN/GATE-OUT and the SMEMA method.

SMEMA interface

The SMEMA interface is standard in the Topaz. In the figure 3.4-2 below the SMEMA connection is shown. The following signals can distinguished:

1) The BUSY-out signal from the main- to the previous (up-stream) –machine.
2) The BA-in (board available) signal from the previous- to the main-machine
3) The BUSY-in signal from the next (down-stream) machine to the main-machine
4) The BA-out signal from the main-machine to the next (down-stream) machine

The logic is as follows:

a) When the main machine is busy (contacts are 'open') no board is sent.
b) When the up-stream (previous) machine has a board available the contacts are closed.
c) When the main machine is not busy and a board is sent, the state of the main machine must go busy, and the signal BA must go false within a preset time period. Machine actions, in case of an error, are optional.
d) The next board may not be sent until the next 'not busy' cycle. The 'busy' and 'board available' signals must at least 50 mS in duration for either state.

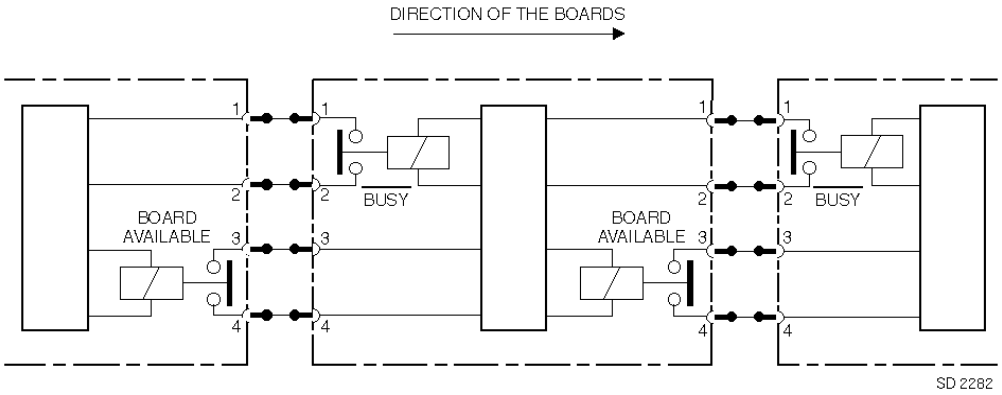


Figure 3.4-2 SMEMA interface

Gate-in/Gate-out interface

The Gate-in / Gate-out is a more simple interface to connect the machines in line.

Gate-in connector (3-pin female)

This is the connector for incoming PCB request-signals from the machine in the next process, the pinning of this connector is as follows:

pin 1: signal NJ15 Count reset signal
pin 2: signal NJ12 Gate-in signal input
pin 3: signal -24C 0V, Ground (shared by NJ15 and NJ12)

Gate-in signal (input):
This signal is received from the machine in the subsequent process. When there is conductivity between (2) <> (3) (closed), the system judges that a request for a PCB loading has been made. When mounting has finished, the PCB is ejected.

Count reset signal:
This signal resets the counter for the max. number of PCB's. If (1) <-> (3) become conductive (closed), the PCB counter is reset.

The output from the subsequent process should be handled as relay contact points (dry contact point, no voltage output). In figure 3.4-3. the gate-in connection is shown.

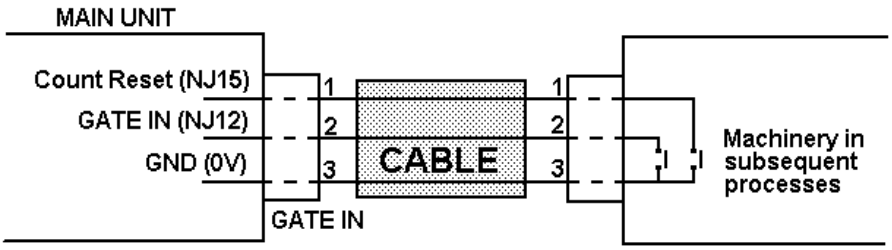


Figure 3.4-3 Gate-in connection [GATE_IN.WPG]

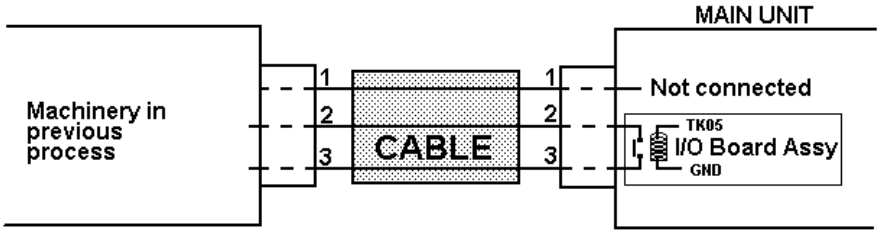


Figure 3.4-4 Gate-out connection [GATE_OUT.WPG]

Gate-out connector (output):
This is the connector for PCB request-signals sent to the machine in the previous process, the pinning of this connector is as follows:
pin 1: empty
pin 2: +24C relay contact point output. --> Dry contact point.
pin 3: TK05 gate-out signal

Gate out signal (output):
This signal is sent to the machine in the previous process. If the machine in the previous process has completed its preparatory operations, it renders (2) <-> (3) conductive (=closed), as a PCB request signal. In figure 3.4-4 the gate-out connection is shown.

How machines are connected to each other using the gate-in and gate-out is shown in figure 3.4-5.

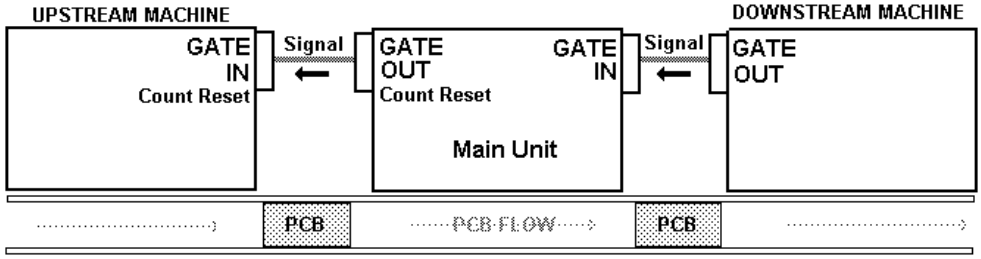


Figure 3.4-5 SMEMA connections

[FLOW.WPG]

Relation between Gate-in/Gate-out and SMEMA

The relation between SMEMA and Gate-in/out is shown in figure 3.4-6. For more details please refer to the overall interconnect diagram of the Topaz (chapter 14).

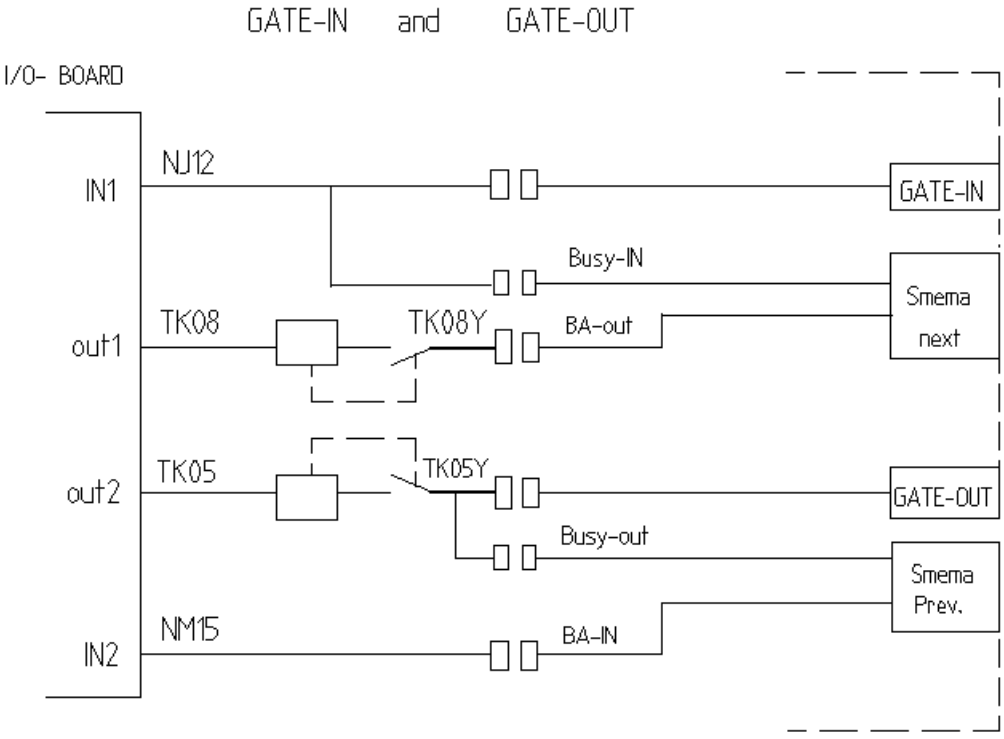


Figure 3.4-6 Principle SMEMA - Gate-in/out

3.5. MCX-Control Unit

3.5.1. MCX-Controller Lay-Out (Second Generation)

In the figure 3.5-1 the second generation MCX-controller box is shown.

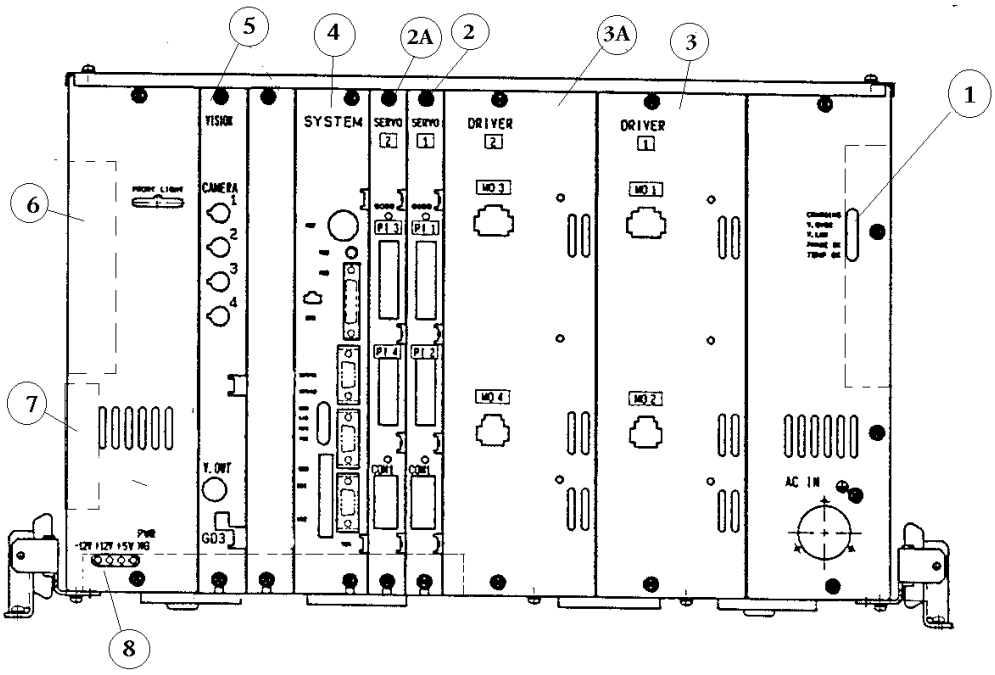


Figure 3.5-1 Second generation MCX-control unit

Table 3.5-1 shows the components of the controller. In chapter 14 an interconnect diagram can be found of all the internal connections of the MCX-control unit.

Part no.	Description	Remarks
1	Driver power board	1x 282V power supply
2	Servo assy	1x servo board
2A	Servo assy	1x servo board for the optional trayfeeder
3	Driver board	1x driver board (X,Y,R,Z, W)
3A	Driver board	1x driver board for the optional trayfeeder
4	System board	1x system board equipped with a 40486DX2 CPU, 8 Mb internal memory
5	VICS2000	1x Vision board
6	5V/12V power supply	5V, +12V and -12V power supply
7	HDD	Hard disk
8	Mother board	Mother board

Table 3.5-1 Controller parts

3.5.2. System Board

Second generation system board

The system board of the MCX controller is a 80486-DX2 CPU based system running at 66Mz. The on-board memory is 8Mbyte. A piggy-back I/O control board is used to control the I/O circuitry. The board, see figure 3.5-2, has the following functions:

- Interfacing to all other PCBs connected to the motherboard
- Hard disk interfacing
- Floppy disk interfacing
- Video interface (VGA)
- Keeps track of Date and Time
- Keyboard interface
- SDLC (I/O1,2) interface control

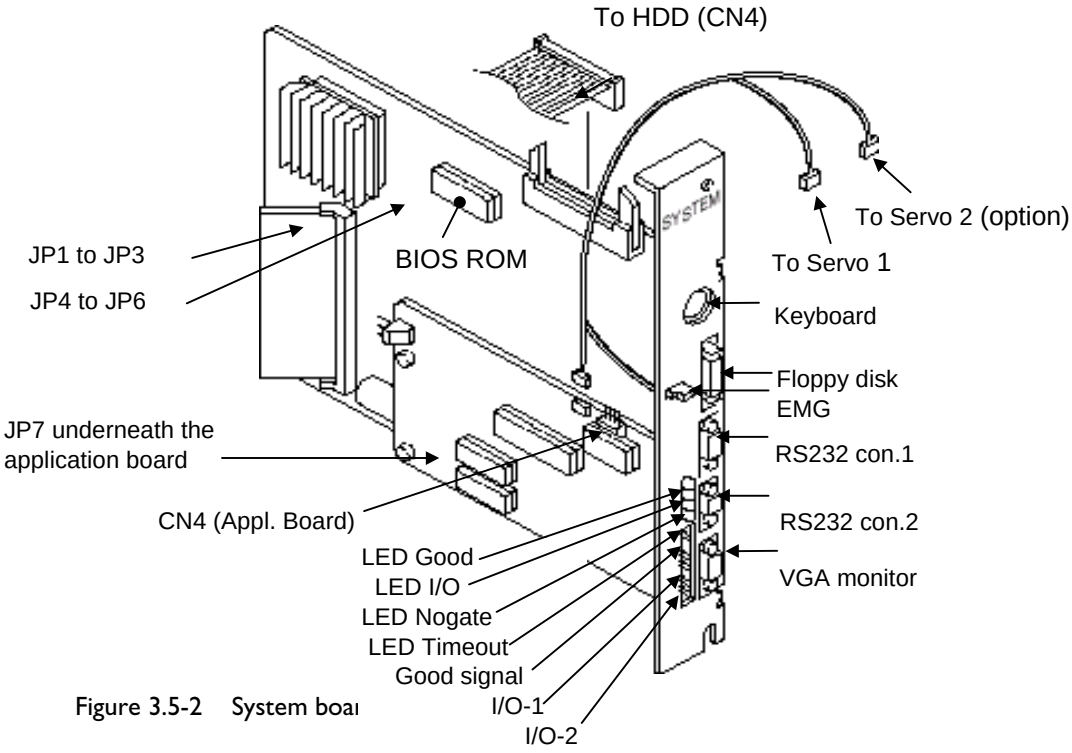


Figure 3.5-2 System boa

The jumper setting, see fig. 3.5-2, on this second generation system board is following:

- JP1 to JP6: Set to position1-2
- JP7: Set to position1-2

On the application board, all six SW1-jumpers are set to 'OFF'.

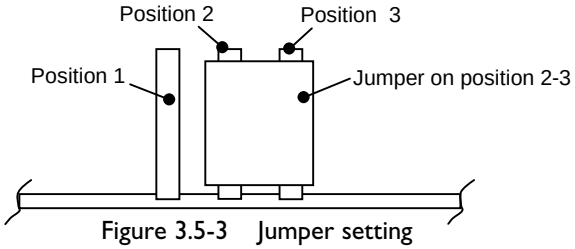


Figure 3.5-3 Jumper setting

At the front this system board has 4 LED indicators, the GOOD signal indicating the POWER OK, the I/O signal which is flashing as long as there is a correct

communication with the I/O PCB's and two signal indications regarding the I/O circuitry (No-gate; no communication at all, and time-out; no response for a certain time).

The signal connector EMG at the front is connected to the EMG circuitry and inhibits a motor movement in case something's wrong inside the MCX controller (Servo NOK, 282V power NOK, etc). The board is equipped with two SIMM modules of 4 Mbyte. (Or one SIMM module of 8 Mbyte).

The application board establishes the I/O-communication between the system board and the various I/O-boards in the Topaz. The main processor on this board is a 8344-12Mhz microcontroller of the brand Intel. The scanning speed of the I/O-ports is about 3-4msec (scanning of all ports).

Third generation system board
In newer GEM systems a new system board is being used which makes the use of a separate harddisk no longer necessary please refer to figure 3.5-4.

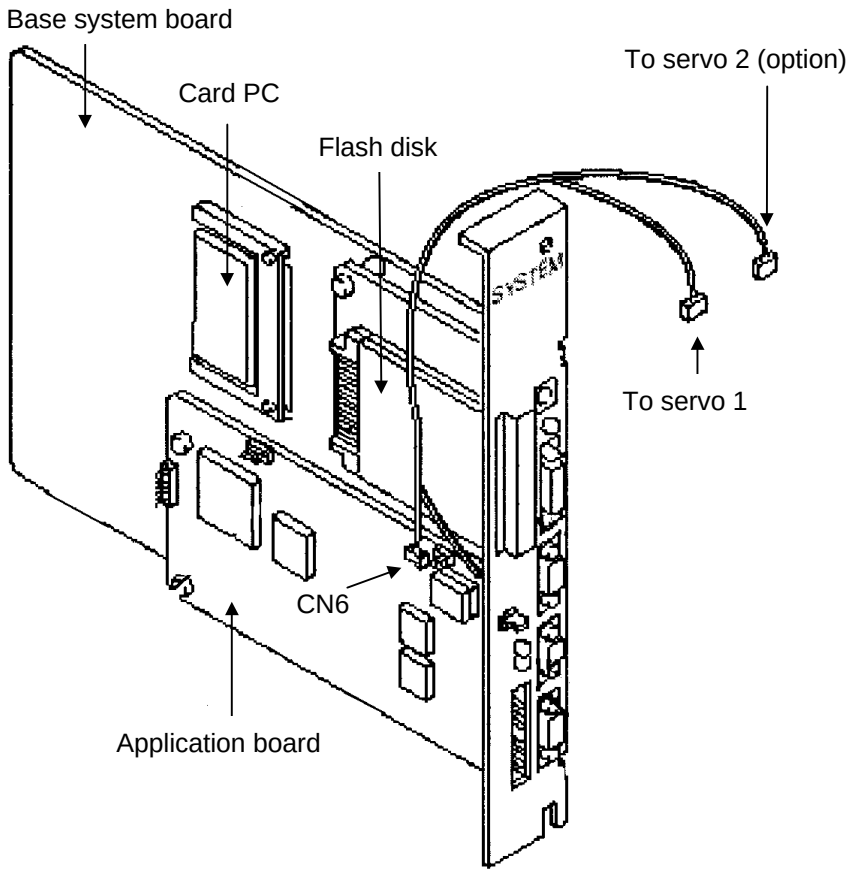


Figure 3.5-4 Third generation system board

The new system board is a modular built unit which encloses following modules:

- **A base system board**
  This interconnects all modules attached to this board. The connectors of this board are almost compatible with the previous board. The keyboard connector has been changed from DIN to mini-DIN, an adapter is available in case the new system board has to be retrofitted in the previous version controller.

- **A PC-card module.**
  The card PC includes the 486DX4-100, an AT chipset, a peripheral controller, VGA controller and memory. The card PC is a module with specifications standardised by OKI, EPSON and PFU.

- **An application-board module.**
  This board establishes the serial communication between the system board and the various I/O-boards in the Topaz. The processor on this board is a Hitachi RISC processor of type SH7021-20Mhz. The I/O-port capacity is expanded while the scanning speed of the I/O-ports has been increased to 1 msec (scanning of all ports). The board has a on-board flash memory for error logging and the software for the various I/O-boards is loaded via the application board in the flash memory of the I/O-boards.
  The board connectors are fully compatible with the previous system board, any difference of application board is detected automatically by the VIOS software, which must be of version 1.2 or higher.

  On the application board two LED's are available, the green LED will light whenever all basic functions work normal. The yellow LED flashes when the I/O serial communication is OK.

- **A flash-memory board module.**
  This board replaces the harddisk in the system by a flash disk. The board includes two slots, slot 1 is standard occupied by a 40Mb flashdisk which can be replaced by a 85 Mb flashdisk. Slot 2, which is only accessible by the shell manager of the VIOS software is an optional 40 Mb or 85 Mb disk. The interface for the flash disk is the IDE interface.

Replacing the Old system board with a new system board
When replacing the KJ0 system unit with the KM5 system unit the following procedure should be followed:

- Update the application software to VIOS 1.2x or a later version with the KJ0 system unit and harddisk.
- Backup the system data and the PCB data from the harddisk to the floppy disk.
- Remove the KJ0 system unit, the harddisk, the harddisk harness and the harddisk power harness from the controller.
- Install the KM5 system unit to the controller and install the application software VIOS 1.2x or a later version. Make sure to use a keyboard adapter to convert from DIN to mini-DIN (5322 263 21196).
- Update the system data from the backup floppy disk.
- Copy the PCB data from the backup floppy disk.

Reference table

As a reference, table 3.5-2 shows the system boards used in the various MCX controllers of the CSM Full-Vision and CSM-GEM systems. It is ***NOT*** recommended to interchange systems because of the differences in memory, front panel and BIOS ROM.

	Full Vision		GEM	
Applicable Controller / Board, etc.	KG2: Comet-I KG7: Eclipse-I	KL0: Comet-II KJ0: Orion, Eclipse-II	KM5: Sapphire, Topaz, Emerald	KM5: Sapphire, Topaz, Emerald
System Board (complete assy)	KJ0 - M4200 - 11x - 12x (5322 214 91532)	KJ0 - M4200 - 01x - 02x (5322 216 04049)	KJ0 - M4220 - 32x (5322 216 04308)	KM5 - M4200 - 00x (5322 216 04468)
Base System Board	KJ0 - M4210 - 11x - 12x	KJ0 - M4210 - 01x - 02x	KJ0 - M4210 - 32x	KM5 - M4210 - 00x KM5 - M4210 - 01x (2)
Application Board	KJ0 - M4220 - 10x	KJ0 - M4220 - 10x	KJ0 - M4220 -10x	KM5 - M4220 - 00x
Front Panel	KJ0 - M4135 - 10x (3)	KJ0 - M4135 - 00x(3)	KJ0 - M4135 - 00x(3)	KM5 - M4135 - 00x
Memory (1)	-11x : 4Mbytes -12x : 8Mbytes	-01x : 4Mbytes -02x : 8Mbytes	8Mbytes	8Mbytes 16Mbytes (4)
BIOS ROM	KJ0 - M42R9 - L0x	KJ0 - M42R9 - 00x	KJ0 - M42R9 - 00x	Not applicable
JP7	2-3	1-2	1-2	Not applicable

Table 3.5-2 Overview system boards

Notes :

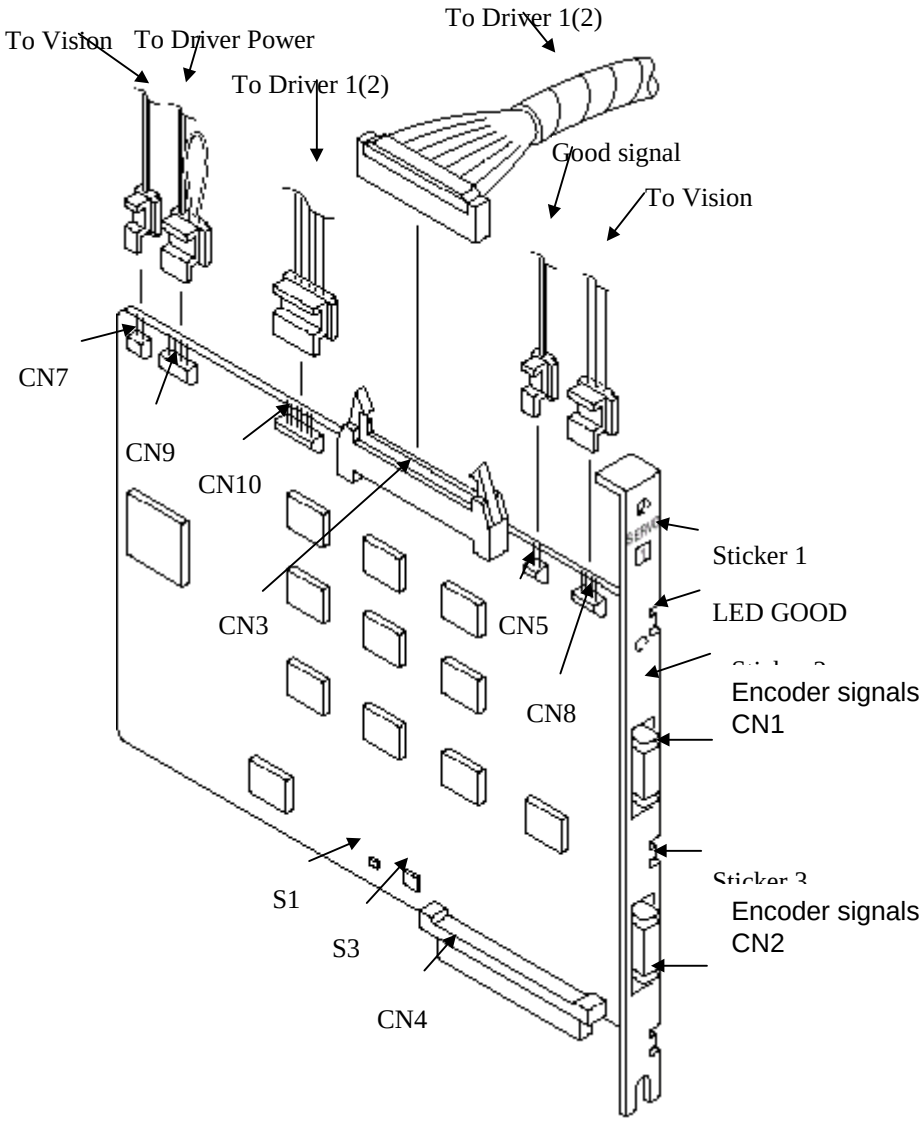
1. VIOS V1.1or later needs 8Mbytes !
2. From December 1998 onwards.
3. Size is different between KJ0-…-10x and –00x.
4. With system board KM5-M4210-01X.

3.5.3. Servo Board

This board, see figure 3.5-5, controls the AC-motor driver-circuitry.
The servo-1 board always controls the driver-1 board, both boards are dedicated for the main machine. The servo-2 board is optional and controls the driver-2 board, both boards are dedicated for options such as traychangers and auto tray stackers.

The servo board receives its power (+5V, +12V, -12V) via the ISA bus (CN4) of the mother-board. This power is forwarded to the driver-board via connector CN10 to feed the logic circuitry on the driver-board.

The powerfail signal is connected to the D(river)-power board via connector CN9. The Good-2 signal is connected to the servo-board via connector CN5



The servo-board receives commands from the system board via the ISA-bus connector CN4 on the mother-board.

The pulse width modulation and feedback (power failure, over current etc.) signals, which control the drivers on the driver-board, are send to the driver-board via connector CN3. Positional feedback is obtained from the motor encoders which are connected to the front side of the servo-board via connectors CN1 and CN2.

The servo-board is linked to the vision board by means of connectors CN7 (positional information) and CN8 (encoder information).

If an error occurs in this unit the display LED GOOD (green) will go out, and the system will enter the emergency stop state (servo off).

The jumpers S1 and S3 on this board have the have the following settings:

Machine type → / Switch ↓	Bit ↓	Topaz Emerald	Sapphire A-table	Sapphire B-table	LCS100 LCS 31 ATS 27
S1	1	ON	ON	ON	OFF
	2	OFF	ON	OFF	ON
S3	1 - 6	ALL 6 OFF			

Table 3.5-3 Jumpers settings S1 and S3

With the servo board a couple of stickers are delivered, these stickers should be mounted at the positions indicated in figure 3.5-5 and according to following table:

Machine type → / Sticker ↓	Topaz Emerald	Sapphire A-table	Sapphire B-table	LCS100 LCS 31 ATS 27
Sticker 1 "Servo .."	1	1A	1B	2
Sticker 2 "PI .."	1	1A	1B	3
Sticker 3 "PI .."	2	2A	2B	4

Table 3.5-4 Stickers versus machine types

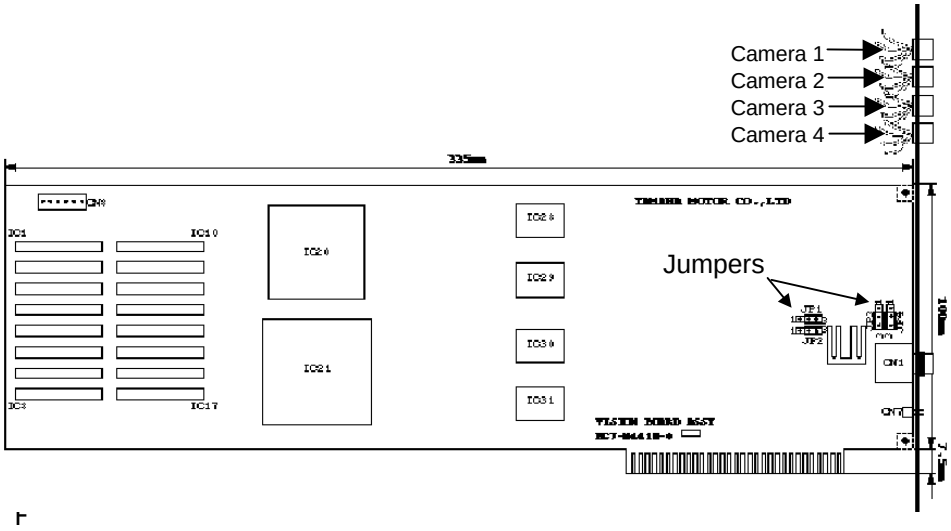
The table below shows if the connectors indicated in figure 3.5-5 have a cable attached to another board ("C"), a short connector ("S") or are left unconnected ("NC").

Machine type → / Connector ↓	Topaz Emerald	Sapphire A-table	Sapphire B-table	LCS100 LCS 31 ATS 27
CN3	C	C	C	C
CN5	C	C	C	C
CN7	C	C	C	NC
CN8	C	C	C	NC
CN9	C	C	S	S
CN10	C	C	C	NC

Table 3.5-5 Connectors versus machine types

3.5.4. Vision Board

The vision board is the VICS2000 and handles all vision related operations (except laser). The board layout is shown in figure 3.5-6 below:



igure 3.5-6 Vision board VICS 2000

The VICS 2000 vision board is equipped with 4 camera connectors, from top to bottom they are used as follows:

Camera "1": Connector for the fiducial camera.
Camera "2": Connector for the optional single view camera.
Camera "3" & "4" The connectors 3 and 4 can either be used both for single-view camera's or both for multi-view camera's depending on the jumper settings. It is not possible to use eg.camera connection 3 for a single-view camera and camera connection 4 for a multi-view camera.
The settings for the jumpers 1 to 4 of the vision board are shown in the table below, see also figure 3.5-7:

Camera "3" & "4":	Jumpers 1 to 4 :
Single-camera	Set jumper to position 1-2
Multi-camera	Set jumper to position 2-3

Table 3.5-6 Camera and jumper settings

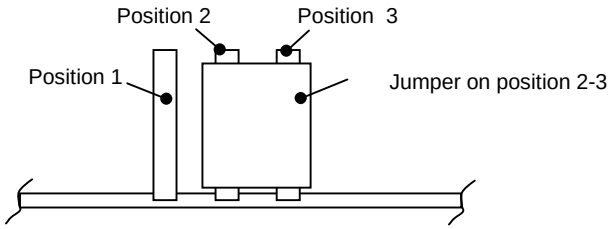


Figure 3.5-7 Jumper setting

3.5.5. Mother Board

This board, see figure 3.5-8 connects the various boards such as the system board, servo board and vision board via an ISA bus. The mother board contains also an AC and DC power failure detection function. The AC input, the DC5V and the +12V/-12V are monitored. A LED indication will show a power voltage drop, instantaneous power failures, and errors in the DC power supply for the control system. Table 3.5-7 below shows the various possibilities.

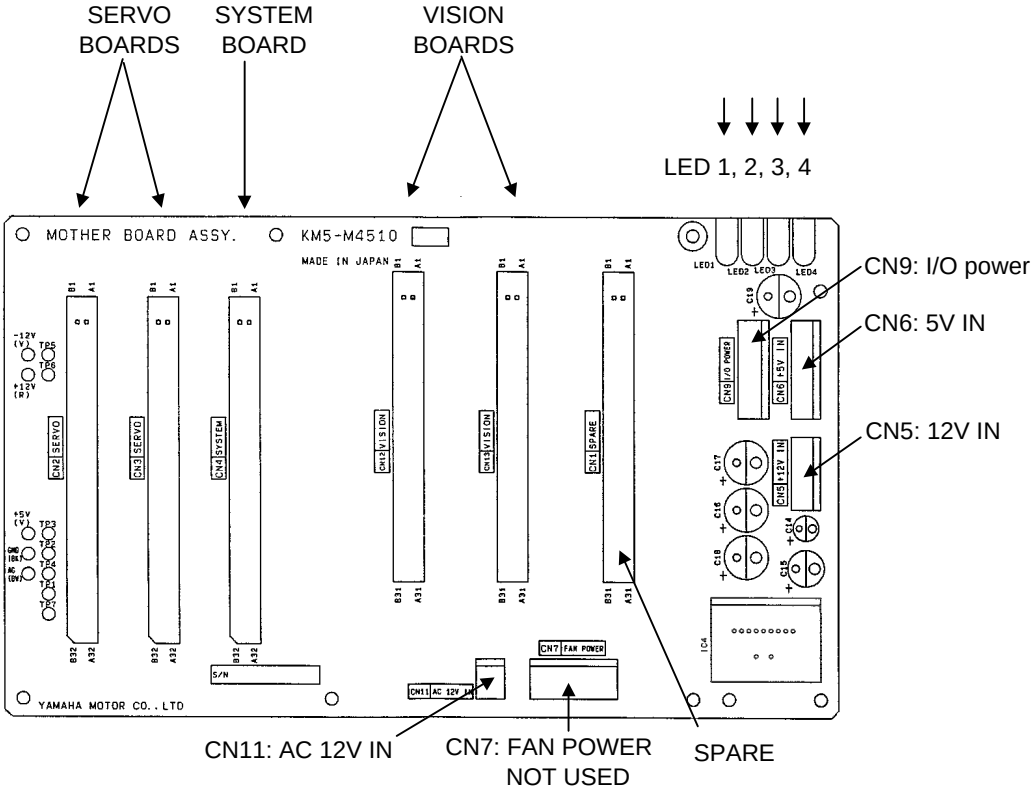


Figure 3.5-8 Mother board

Legenda: **R**→ Lit red
G → Lit green
X → Not lit
— → not defined.

Specification / Display LED		PWR NG (Normally off) LED 1	+5V (Normally on) LED 2	+12V (Normally on) LED 3	-12V (Normally on) LED 4	NOTE
200VAC:	VAC ≥ 180V	**X**	—	—	—	Normal AC
(VAC)	VAC ≤ 160V	**R**	—	—	—	voltage drop
+5VDC:	V1: ≥ 4.75V	—	**G**	—	—	Normal DC
(V1)	V1: < 4,75V	—	**X**	—	—	5V
	V1: < 4.5V	**R**	**X**	—	—	Error
+12VDC:	10.8V ≤ V2 ≤ 13.2V					Normal DC
(V2)	10.8V > V2 > 13.2V	—	—	**G**	—	+12V error
		—	—	**X**	—	
-12VDC:	V3 < -10.8V	—	—	—	**G**	Normal DC
(V3)	V3 > -10.8V	—	—	—	**X**	-12V drop

Table 3.5-7 Meaning of the LED indicators

Remark: It is possible that some mother boards have more connectors, this because some GEM machines need more PCB's (more axes, etc).

3.5.6. Hard- and Floppy-Drives and Flash Disk

Hard-disk
In systems equipped with an old type system board, please refer to section 3.5.2, the hard-disk, see figure 3.5-9, is located at the left side of the MCX compartment.

This physically large drive is formatted as a 40 Mbyte drive for speed reasons.
The 5V/12V power supply for the hard-disk is coming from the mother-board via connector CN9. The signal cable is connected to the top side of the system board inside the MCX controller.

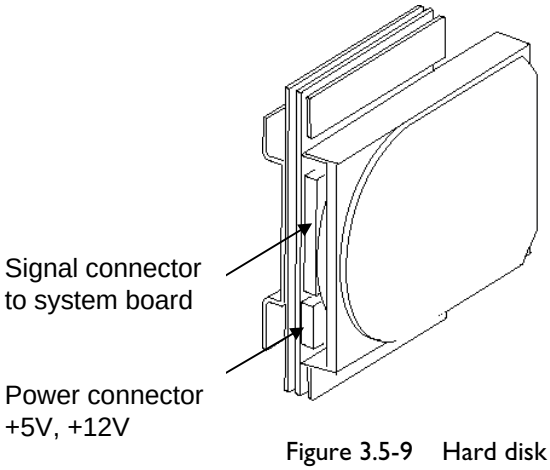


Figure 3.5-9 Hard disk

Floppy-disk
The 1.4 Mbyte floppy drive is located in the service panel behind cover door at the right bottom front side of the machine.

The drive is connected via a harness to the front side of the system board FDD connector.

Flash-disk
In systems equipped with a new type system board, please refer to section 3.5.2, the hard-disk has been replaced by an on-board flash disk.

The flash disk is located on the system board and has two slots which are accessible from the front side of the system board. Each slot can contain a removable flash disk.

Standard one 40 MB flash disk (5322 693 11447) is available on the system board, optional this disk can be replaced by a 85 MB drive. If a flashdisk is mounted in the second slot this disk is only accessible via the shell manager.

Note:
When inserting or removing a flashdisk the Topaz should be switched off because the disk is not protected against such handling and might get damaged. Be sure to always mount the protective cover over the flash disk after mounting.

3.5.7. Driver Board Assy

This board, see figure 3.5-10 below, can drive AC motors for up to 7 axes. The amount of motors used depends on the type of machine. In the MCX controller the driver-1 board is always used for the main machine while the driver-2 board is dedicated for options such as traychanger and auto tray stacker (ATS).

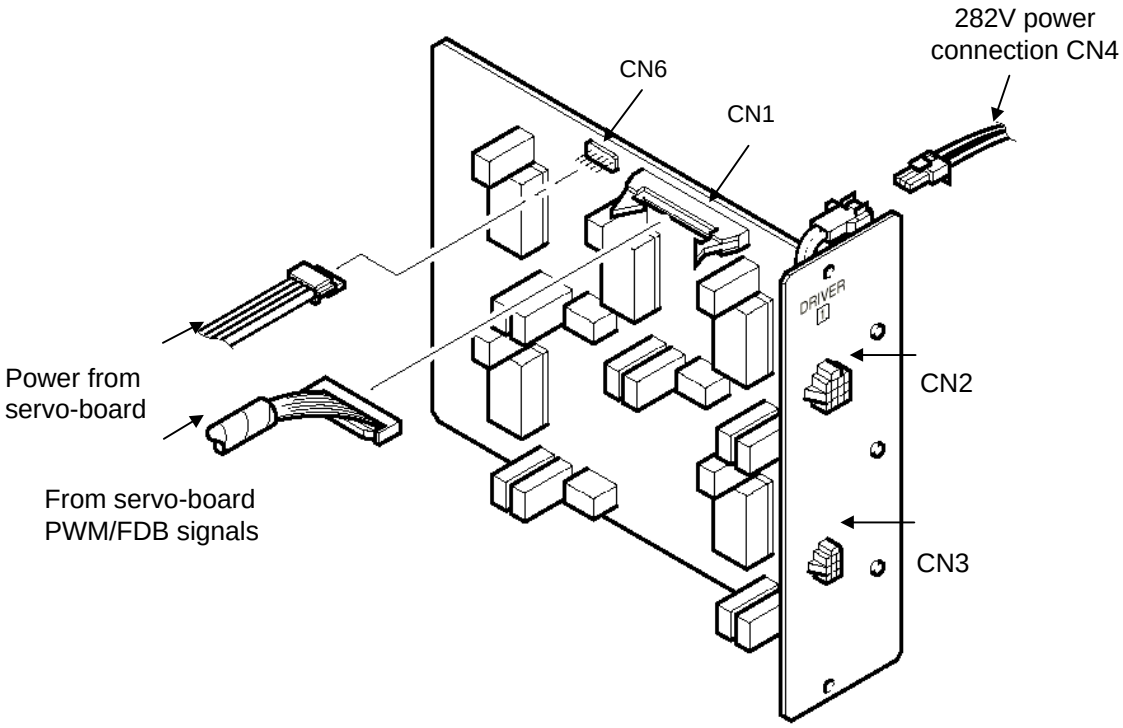


Figure 3.5-10 Driver board

The motor driver DC power is 282VDC and is supplied by the D(river)-power supply via CN4. On the driver-board the 282V DC is converted into an AC signal for driving the 3-phase AC-motors. This is done as shown in figure 3.5-11.

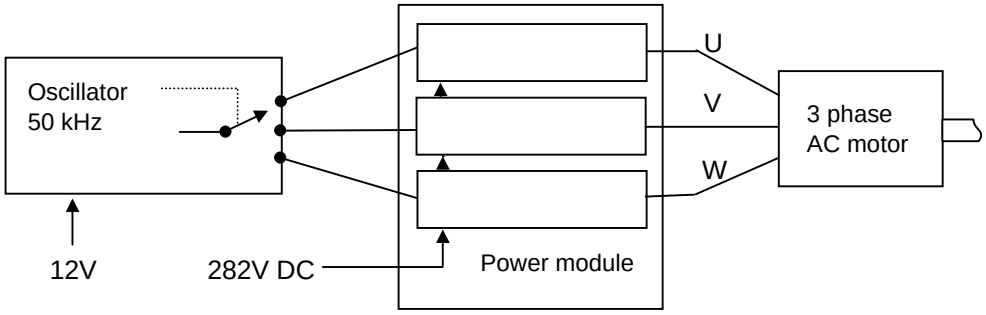


Figure 3.5-11 Driver board principle

Note that only the X and Y motors are actual three phase motors !

A 50KHz oscillator, powered at 12V, activates every power transistor (which switches 282V) sequentially thus creating a 3-phase (U,V,W) AC-signal for driving the motors.

The GTR (Giant Transistor) module which controls the current is located at the rear side of the drive board and is mounted on a large heat-sink.

The motor current of a maximum of 4 axes is fed via CN2, and a max. of 3 axes via CN3 to the AC-motors.

The 5V & ±12V power for the oscillator and logic circuitry is received from servo board via CN6. The current of the logic power is controlled by an IPM (Intelligent Power Module) which is fixed on the heat-sink.

The pulse width modulation and feedback (power failure, over current etc.) signals, from the servo-board are received via connector CN1.

Note: It is possible that not fully populated driver-boards are installed. The board only contains the drivers for the axes needed in the system. The not fully populated boards can always be replaced by a fully populated board which are stocked.

There are only two versions of driver-boards, one for the main systems (KJ0-M5810-E2x) and one for the options (KJ0-M5810-42x) such as traychangers (LCS) and auto tray stackers (ATS).

The table below shows of the various driver-boards used in the CSM-F(ull)V(ision) and CSM-GEM systems:

Factory number KJ0-M5810- xxx	Philips service no.	Machine type	Remarks
-31x, -32x	5322 216 04018	CSM 66, 84, 84V III	partly populated board
-41x, -42x	5322 216 04262	LCS31, LCS100, ATS27	partly populated pcb
-51x, -52x,	5322 216 04021	CSM 66, 84, 84V III	partly populated, is replaced by 5322-216-04018
-71x, 72x	5322 216 04017	CSM 66, 84, 84V III	partly populated, is replaced by 5322-216-04018
- A1x, A2x	5322 216 04054	Orion, Eclipse-II, Comet-II	full populated
- E2x,	5322 216 04309	Topaz, Emerald, Sapphire	full populated

Table 3.5-8 Driver board types

3.5.8. D(river) – Power Assy

The D-power assy rectifies the 3-phase 200VAC power and supplies 282VDC to the driver boards. The assembly consists out of the D-power-board itself and the capacitor CAP1 which is located at the right-side back corner of the MCX controller box, see also figure 3.5-12 below.

For more details please refer to chapter 4, power supply systems.

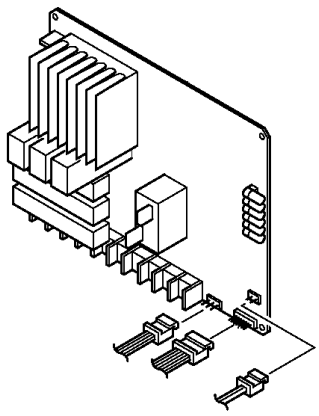


Figure 3.5-12 Driver power board

3.5.9. 5V / 12V Power Supply Assy's

The MCX-2 control unit has one power supply for the +5VDC and the +/- 12V DC. The power supply is mounted at the left side in the MCX-2 control box.(see fig.3.5-13)

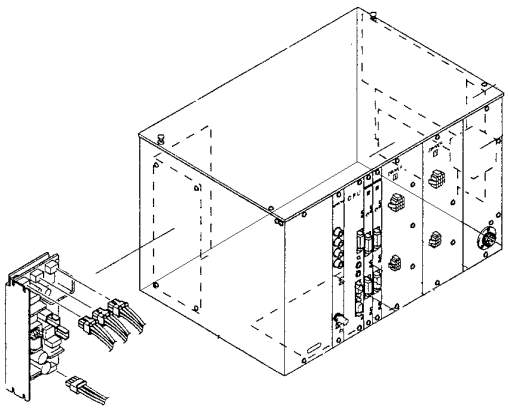


Figure 3.5-13 5V,+12V,-12V Power supply

For more details please refer to chapter 4 "power supply systems".

3.6. LED Driver Board

The LED driver board is the board, see figure 3.6-1, which controls the light intensity of the component camera(s). There are various types of LED-drivers, for the Sapphire and Topaz systems the same version (5322 216 04315) is used. This board can handle two line-sensor (multi-camera) lighting outputs and 1 area-CCD camera (single camera) lighting output.

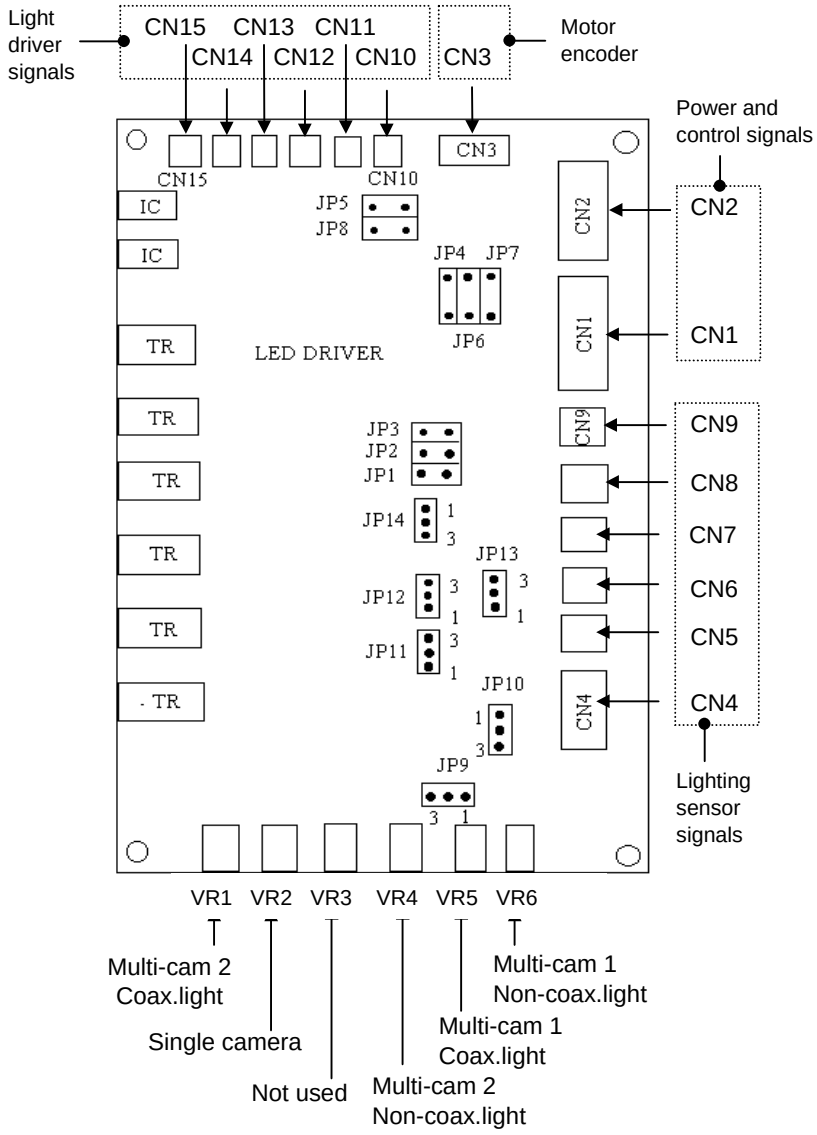


Figure 3.6-1 LED driver board

Each output has 2 channels, each channel has a brightness adjustment (VR1 - VR6). The line sensor channels are equipped with a brightness feedback system.
This means the lighting unit has a sensor which measures the brightness, the latter is compared with the reference brightness and as a result of this the brightness difference controls the LED current. In order to protect the LED's for maximum current, the board contains a current limitter circuit. The board also contains a speed-feedback circuitry which is currently not in use.

Remarks:

- The jumper setting is fixed and is the same for both the Sapphire and Topaz.
- The LED driver board for the Emerald is NOT compatible with the one used in the Sapphire/Topaz because of the difference in the current limiters.

The following table shows the relation between the several cameras, connectors, potentiometers, max currents and jumpers in the hard- and software. Please refer to figure 3.6-1 for the location of the various items.

	Vision Board	Camera 1 "Fiducial cam."		Camera 2		Camera 3		Camera 4	
HARDWARE	**LED driver board**	-							
	LED driver output	-		2		3		4	
	Light type (note 2)	-		A	B	A	B	A	B
	Potentiometer	-	-	VR3	VR2	VR1	VR4	VR5	VR6
	Output connector	-	-	CN10	CN11	CN12	CN13	CN14	CN15
	Sensor connector	-	-	CN4	CN5	CN6	CN7	CN8	CN9
	Sensor jumper	-	-	JP9	JP10	JP11	JP12	JP13	JP14
	Speed jumper	-	-	JP4	JP4	JP6	JP6	JP7	JP7
	SL-bit jumper (note 3)	-	-	JP1	JP1	JP2	JP2	JP3	JP3
	Max current [mA]	-	-	120	120	90	400	90	400
VIOS	3/1/option config/ camera combination	-		1		2		3	
	3/2/MCH_DATA/ camera coordinate	-		Single camera 1		Multi camera 2 (note 1)		Multi camera 1 (note 1)	

Table 3.6-1 Vision board settings and controls

NOTE 1: When the Topaz is only equipped with one multi camera, the camera is defined as multi-camera 1 regardless of the physical position of the camera. If the Topaz is equipped with two multi-cameras the front camera is defined as multi-camera 1 and the rear one as multi-camera 2.

NOTE 2: When the table indicates a light type "A" the coaxial light is meant. When referring to the light type "B" the non-coaxial light is meant. Please be aware that the Emerald uses another definition for light type A and B; the B type in the Emerald is the CSP lighting !

NOTE 3: The SL-bit is the Special Light bit setting which is used for switching between the coaxial and non-coaxial light, please refer to the text below.

On the LED driver-board three jumpers provide a special light bit setting, this special light bit is used to switch between the coaxial light and the non-coaxial light. As we do normally use both together we do not need to change the settings. Table 3.6-2 below shows the settings for these jumpers for verifying purposes only.

	JP1-3 SET		JP1-3 REMOVED	
Special light bit	Light A	Light B	Light A	Light B
OFF	OFF	ON	ON	ON
ON	ON	OFF	ON	OFF

Table 3.6-2 Vision board special light bit settings

On the LED driver board a number of jumpers are available which are set from factory. The table below shows the setting of these jumpers for verifying purposes only.

Jumper No.	JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8
Setting:	X	-	-	X	-	X	X	-

"X" = Jumper set "-" = Jumper not set

Jumper No.	JP9	JP10	JP11	JP12	JP13	JP14
Setting:	2-3	2-3	1-2	1-2	1-2	1-2

"2-3" or "1-2" is the jumper setting, refer to figure 3.6-5 for an example.

Table 3.6-3 Vision board jumper settings

As mentioned before the board is equipped with a speed feedback circuitry which is currently not in use. For informational purposes only the table below indicates which light type and which camera is equipped with this functionality.

Camera No.	Cam. 2		Cam. 3		Cam. 4	
Light No.	Light A	Light B	Light A	Light B	Light A	light B
Light and feedback control	No	No	No	Yes	Yes	Yes

Table 3.6-4 Vision board feedback control overview

3.7. I/O - Boards

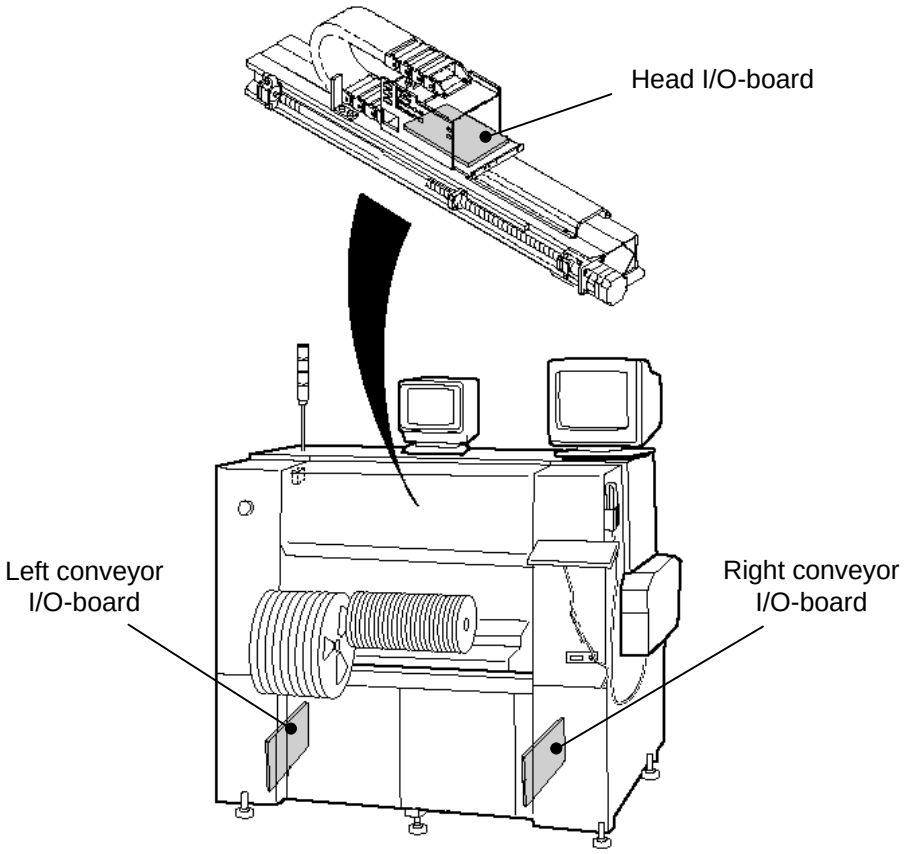


Figure 3.7-1 Location of the I/O boards

The Topaz is equipped with three I/O-boards, one head-I/O and two conveyor-I/O boards, refer to figure 3.7-1.

The function of the I/O-boards is to translate and buffer signals from/to the system unit to/from the actuators/sensors.

The head I/O-board performs above function for all actuators and sensors in the head assy while the conveyor I/O-boards perform this function for all other actuators and sensors in the system.

Second generation I/O-boards
The I/O-boards of the second generation consist of a mother-board and a daughter-(core-) board.

The mother-board is a large PCB containing the DI/DO-drivers, power circuitry and some settings. The daughter-PCB, also called the core-board, contains the logic- and communication-circuitry of the I/O-board.

The I/O-boards are communicating with the system- (CPU-) board via a SDLC-protocol. The Intel 8344-microprocessor on the daughter-board is controlling this communication.

The daughter-board also contains a ROM- and a RAM-memory. The ROM-memory holds the software for the 8344-processor, this software is loaded into the memory of this processor at start-up. The 8344-processor uses the RAM-memory as a temporary data storage.

The mother-board of the I/O-board contains a couple of dip-switches which function Is described in the table 3.7-1.

Dipswitch: / Board:	1	2	3	4	5	6	7	8
I/O-conveyor right	0	1	0	0	0	0	0	0
I/O-conveyor left	0	1	0	1	0	0	1	1
Switch functionality	Type of board	Type of board	Type of board	Left/right setting	No function	No function	Terminator use	Terminator use

"1" = ON
"0" = OFF

Table 3.7-1 I/O-board DIP-switch settings

Third generation I/O-boards

The I/O-boards of the third generation, the successors of the second generation, consist also of a mother-board and daughter- (core-) board with the same functionality as the second generation boards.

The Intel 8344 microprocessor on the daughter-board has been replaced with the Hitachi SH7021-20MHz processor to control the communication between system board and I/O-boards. The communicating protocol has been changed from SDLC to HDLC (High Level Data Link Control). For establishing the HDLC protocol the SH7021-processor makes use of the dedicated component SAB82526N also located on the daughter-board.

The new processor reduces the I/O-scanning time to less than 1msec instead of the 3 to 4 msec in the second generation boards.

Similar to the second generation I/O-boards the third generation daughter-board processor makes use of a ROM- and RAM-memory. The RAM-memory basically has not changed and is used by the processor for temporary data storage. However the ROM-memory has been changed to a flash-ROM.

This flash-ROM in combination with the third-generation system-board and VIOS 1.2 software or higher enables the software for the SH7021-processor to be uploaded from the system unit at start-up. For this reason the flash-ROM contains a read-only part and a readable/writable part. The read-only part contains some dedicated software nessecary for the software download. The readable/writable part is used for the software download from the system unit.

The connectors of both the second and third generation board are fully compatible enabling upwards compatibility for the PNP type I/O-boards.

The boards of the third generation are shown in the figures 3.7-2 and 3.7-3 below. In these figures the location of the indicators and settings are highlighted.

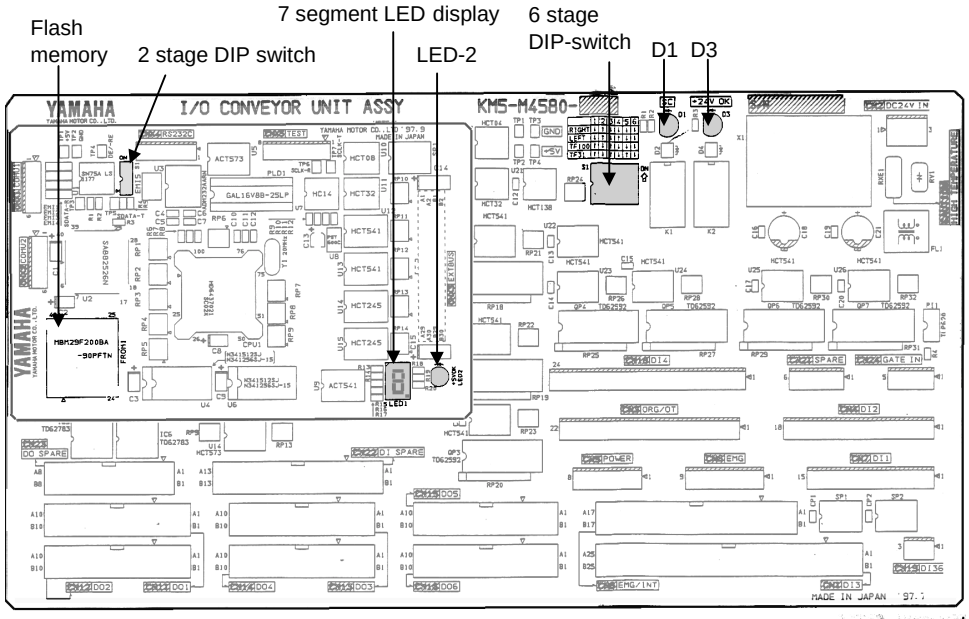


Figure 3.7-2 Conveyor I/O-board

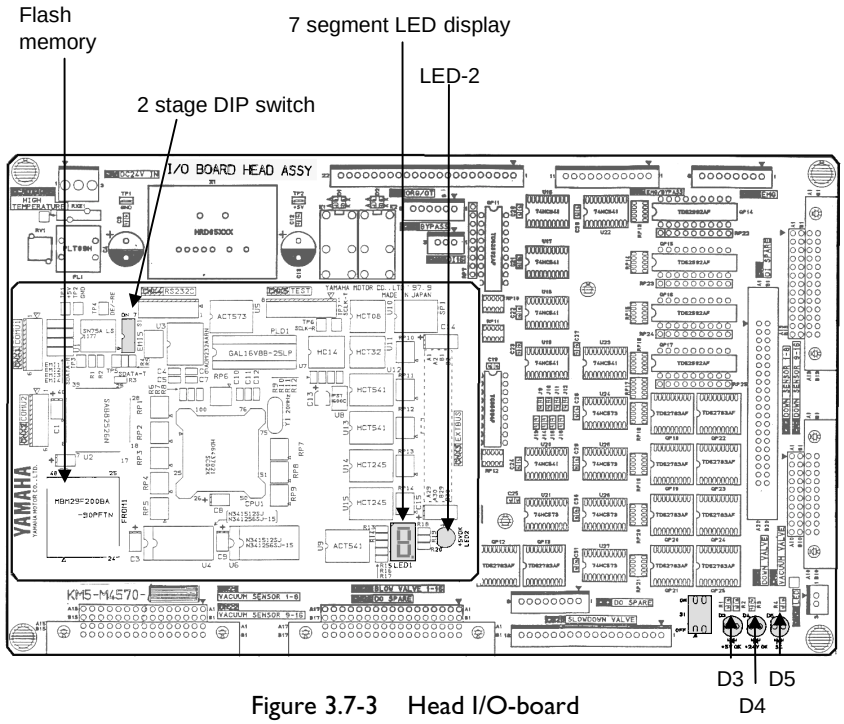


Figure 3.7-3 Head I/O-board

The green LED on the core-board and the green LED D3 on the head I/O-board indicate a good +5V supply when lit.

The 7-segment display has been added for self-diagnosis purposes, the error codes are shown in the table below.

Error code	Meaning
1	Host communication time is over; interruption in communication.
2	Analogue-digital conversion error; I/O-board broken.
3	HDLC controller time is over; I/O-board is broken.

Table 3.7-2 Core-board error codes

The yellow LED D1 on the conveyor I/O-board and D5 on the head I/O-board indicate whether there is a serial communication or not, following codes are used for this communication LED indicator :

Code	Meaning
Fast flashing	Normal operation
On-on-off…on-on-off…	Host communication time over error, display shows code "1".
On-off…on-off…	+24V line shorted or broken.

Table 3.7-3 I/O-board communication indicator

The green LED D3 on the conveyor I/O-board and the green LED D4 on the head I/O-board indicate a good +24V when lit.

The 6-stage DIP-switch on the conveyor I/O-board is necessary to make the board suitable for either the left or right side or a trayfeeder. The table below shows the settings:

Dipswitch: / Meaning:	1	2	3	4	5	6
I/O-conveyor right	0	1	0	0	0	0
I/O-conveyor left	0	1	0	1	0	0
Trayfeeder 100	1	0	1	0	0	0
Trayfeeder 31	1	0	1	1	1	0

"1" = ON
"0" = OFF

Table 3.7-4 I/O-board DIP-switch settings

The third generation boards have the same amount of DIP-switches as the second generation boards however the switches for terminator use have been moved to the daughter-board (core-board), refer to "2-stage DIP-switch" in figures 3.7-1 and 3.7-2. The settings are shown in the table below:

	Sapphire		Emerald/Topaz	
Dipswitch: / Meaning:	1	2	1	2
I/O-conveyor right, Trayfeeder/ATS	0	0	0	0
I/O-conveyor left	0	0	1	1
Head I/O	1	1	1	1

"1" = ON , enable
"0" = OFF, disable

Table 3.7-5 I/O-board DIP-switch terminator settings

The second generation I/O-boards may be replaced by third generation I/O-boards with some restrictions. Table 3.7-6 below shows an overview of the I/O-boards and the machines they can be used in.

	Board types :	**Suitable for machines** (for abreviations see table below) :	**ROM versions** (latest version, basic flash ROM indicated with F) :	**Core board + Mother-board :**
Conveyor I/O	KG2-M4520-21x (npn) (5322 214 91259)	EI, CI	KG2-M45R9-002	n.a.
	KG2-M4580-00x (pnp) (5322 216 04002)	EI*, EII, EM, O, T, CI*, CII, S	KG2-M45R9-023	n.a.
	KM5-M4580-00x (pnp) (5322 216 04471)	EII, O, EM [2], T [2], S [2]	KM5-M45R9-10X (F)	KM5-M4560-11X + KM5-M4582-00X
Head I/O	KG2-M4520-11X (npn) (5322 214 91258)	CI	KG2-M45R9-002	n.a.
	KG2-M4570-00X (pnp) (5322 216 04004)	CI*, CII	KG2-M45R9-023	n.a.
	KG7-M4520-01X (npn) (5322 214 91374)	EI	KG7-M45R9-00X	n.a.
	KG7-M4570-01X (pnp) (5322 216 04001)	EI*, EII, EM	KG2-M45R9-023	n.a.
	KM5-M4570-00X (pnp) [1] (5322 216 04313)	S	KG2-M45R9-030	n.a.
	KM5-M4570-01X (pnp) (5322 216 04469)	S	KM5-M45R9-10X (F)	KM5-M4560-11X + KM5-M4572-00X
	KM1-M4570-00X (pnp) (5322 216 04083)	O, T	KG2-M45R9-023	n.a.
	KV1-M4570-00X (pnp) (5322 216 04628)	O, T	KM5-M45R9-10X (F)	KM5-M4560-110 + KV1-M4572-00X

Abreviation	Meaning
EI	Eclipse I
EI*	Eclipse I-CE
EII	Eclipse II
EM	Emerald
CI	Comet I
CI*	Comet I-CE
CII	Comet II
S	Sapphire
O	Orion
T	Topaz

Remarks:

1. Board will be stopped in March 1998 and replaced by KM5-M4570-01X.
2. This board is standard implemented in these machines from December 1998 onwards, for Sapphire from august 1998 onwards.

Table 3.7-6 I/O-board versions

3.8. Connection-Board

3.8.1. General

The connection-board interconnects all signals from and to the sensors, switches, relays and some valves. All signals which are not directly controlled by the MCX-controller and I/O's signals which are controlled directly by the I/O-boards are not going via the connection-board. The board is also distributing the 24VDC coming from the GS21 power supply and which is used for the I/O and the EMG-circuits.

From April 2000 onwards the Topaz system is equipped with the type of connection-board that is also used in the X-series Topaz. So the 2nd generation connection-board KU1-M4550-00X (with service no. 5322.216.04312) has been replaced by a new version, the 3rd generation connection-board KV7-M4550-11X (with service no. 5322.216.04675).

Connection-board version	Generation	Service number
KU1-M4550-00X	2 (old type)	5322 216 04312
KV7-M4550-11X	3 (new type)	5322 216 04675

Table 3.8-1 Connection-board versions

The differences between the KV7-M4550-11X board (3rd generation) and the older KU1-M4550-00X board (2nd generation) are:

1. The 3rd generation board contains more LED indicators:
   - 21 LEDS (red) for EMG indications
   - 14 LEDS (green) for the various +24V power sources
2. At the 3rd generation board only one 24V input connection (CNF21) is used. This means that the connector going to CNF22 on the 2nd generation connection-board is not used anymore and can be stowed away in the cable duct.
3. The 3rd generation board contains automatic fuses. These fuses protect the various +24V powers sources. The fuses are of a type, which trip above a certain current and restores it self after power is disconnected.

In chapter 14 a detailed logic diagram is shown of both boards and on the next pages the layout of both PCB's are shown. Since the PCB is very important for the safety-circuit, a number of LED's are mounted on the PCB to indicate the EMG status. For more information on these LED's please refer to chapter 4 "Power and Safety" of this manual. On the boards some jumper settings can be set to configure the system depending on the added options and/or features.

3.8.2. 2nd Generation Connection-Board

On the board 3 selection switches are available; S1, S2 and S3.
S1 and S2 are used for the PCB direction, S3 is used for tray-changer positions.

The tables below show the setting of S1 and S2 for the transport selection and S3 for the traychanger position.

PCB direction	S1	S2
L → R (default)	B	C
R → L	A	C

Table 3.8-1 S1 and S2 settings

Configuration	S3 : bit 1	S3 : bit 2	S3 : bit 3	S3 : bit 4
Standard	ON	ON	ON	ON
Trayfeeder	ON	OFF	OFF	ON
ATS-27A	ON	OFF	ON	OFF

Table 3.8-2 S3 settings

Figure 3.8-1 shows the location of S1-3.

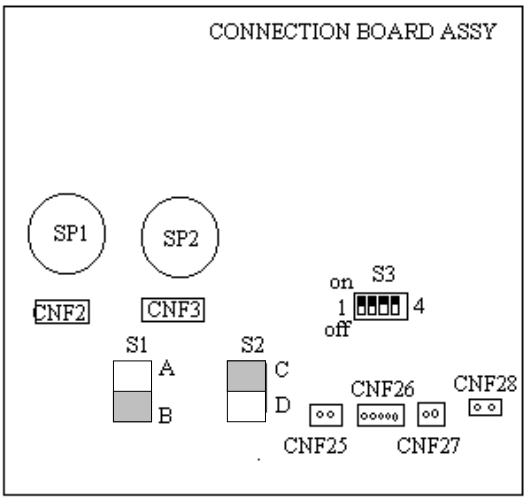


Figure 3.8-1 Location of S1, S2 and S3

Note 1: The EMG harness of the trayfeeder should be connected to CNF26 and CNF28.

Note 2: The speedcontroller connects on SP1, the jumper harness does not connect on CNF2 and CNF3.

Note 3: When a special emergency input is added, set bit 3 of S3 to OFF and connect the emergency signal harness to CNF25 (dry contact).

Figure 3.8-2 shows the complete layout of the 2nd generation connection-board.

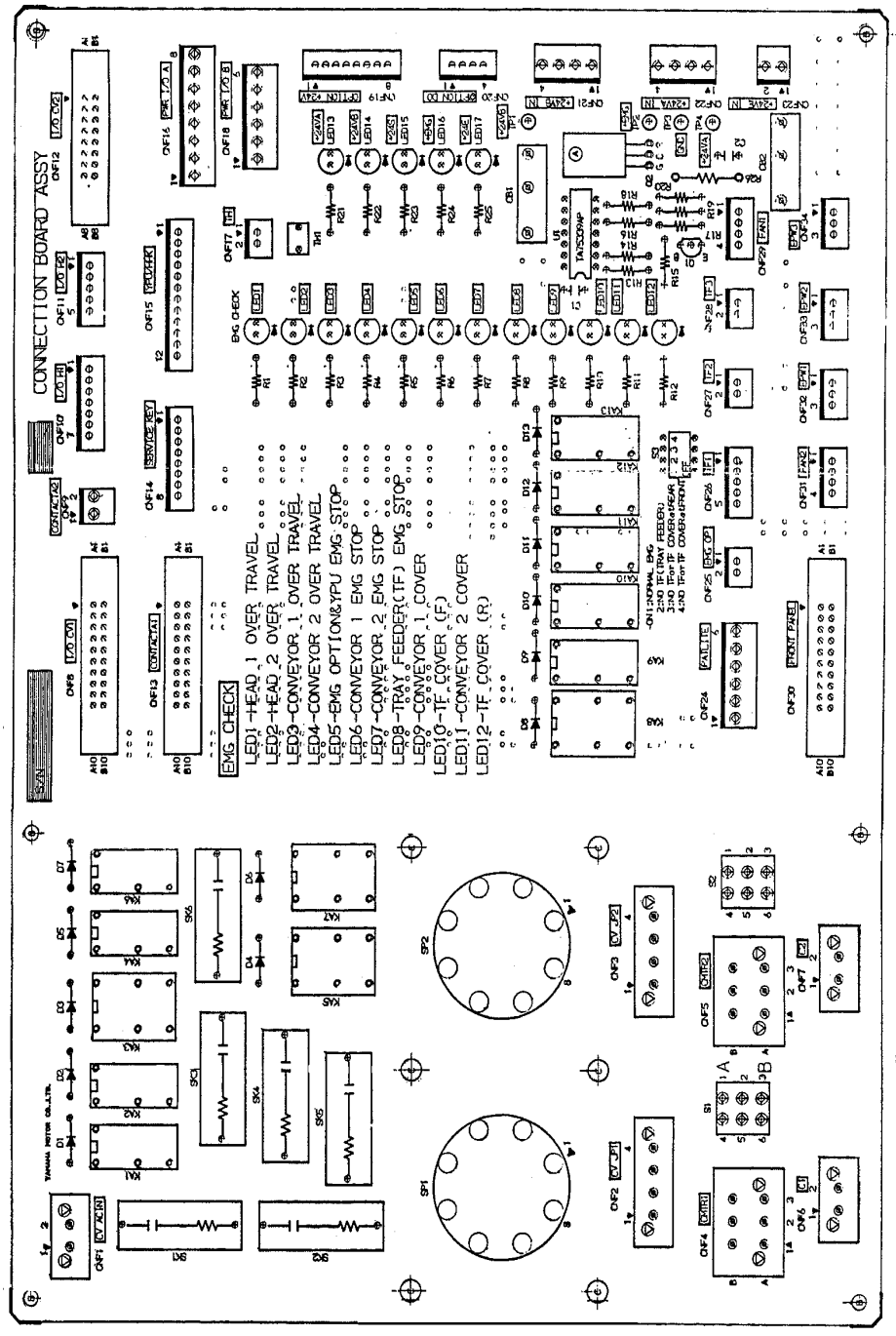


Figure 3.8-2 2nd generation connection-board layout

3.8.3. 3rd Generation Connection-Board

Dip switch settings:
When using the 3rd generation connection-board with factory no. KV7-M4550-11X in combination with an external device, the dip switch (jumper) settings of S3 and S4 have to be set as follows.

The settings for S3 are as follow:

Configuration	S3 : bit 1	S3 : bit 2	S3 : bit 3	S3 : bit 4
Standard	ON	ON	ON	ON

Table 3.8-3 S3 settings

In some schematics S3 has 6 jumper switches. The 2 additional jumpers (in that case bit 2 and 3) are meant for area sensor selections. This option is not used in the current systems, so these bits are always set to 'ON', which means that the EMG circuit connected to this jumper has been bridged.

The settings for S4 are as follow:

Configuration	S4 : bit 1	S4 : bit 2	S4 : bit 3	S4 : bit 4	S4 : bit 5	S4 : bit 6
No trayfeeder	ON	ON	ON	ON	ON	ON
LCS [1]	OFF	ON	ON	ON	OFF	ON
ATS27 [2]	OFF	ON	ON	ON	ON	ON
ATS27 [3]	ON	OFF	ON	ON	ON	ON

Table 3.8-4 S4 settings

Note 1: Connect EMG harness of the tray-feeder to CNF26 (S4-bit1) and CNF28 (S4-bit5) (see position A, figure 3.8-3).

Note 2: Connect EMG harness of the tray-feeder to CNF26 (S4-bit1) (see position B, figure 3.8-3).

Note 3: Connect EMG harness of the tray-feeder to CNF49 (S4-bit2) (see position C, figure 3.8-3).

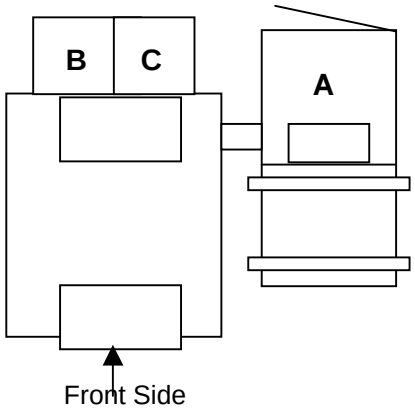


Figure 3.8-3 Position of LCS and ATS on main machine

Remark:
Pre-defined settings are shown in table 3.8-4. Other settings are possible but then different connectors are used. Please refer to the interconnect and safety diagrams and the overview of table 3.8-5 to 3.8-7.

The relation between the S3 and S4 dip switches, connectors and LED's are as follow:

S3 with 4 dip switches:

Bit	Connector	Signal	LED
1	CNF25 (EMG optional)	EMG1	5
2	CNF45 (EMG spare)	EMG4	19
3	CNF45 (EMG spare)	EMG5	20
4	CNF45 (EMG spare)	EMG6 (=8)	21

Table 3.8-5 S3 with 4 dip switches

S3 with 6 dip switches:

Bit	Connector	Signal	LED
1	CNF25 (EMG optional)	EMG1	5
2	n.a. only used for area sensor in main machine	EMG3A	19
3	n.a. only used for area sensor in main machine	EMG3B	20
4	CNF45 (EMG spare)	EMG4	21
5	CNF45 (EMG spare)	EMG5	22
6	CNF45 (EMG spare)	EMG6 (=8)	23

Table 3.8-6 S3 with 6 dip switches

S4 dip switches:

Bit	Connector	Signal	LED
1	CNF26 (TF1 EMG switch)	EMG1F	11
2	CNF49 (TF4 EMG switch)	EMG2	12
3	CNF27 (Cover front 1 TF2)	EMG2B	14
4	CNF43 (Cover front 2 TF5)	EMG2C	15
5	CNF28 (Cover rear 1 TF3)	EMG2E	17
6	CNF44 (Cover rear 2 TF6)	EMG3	18

Table 3.8-7 S4 dip switches

After swapping the connection board:

- Check and/or change the dip switch settings or harness connections.
- Check if the EMG circuit is activated after pressing the various emergency push buttons or when opening the covers of the main machine and if connected on the external devices.

In chapter 4 a revised diagram is shown of the simplified safety circuit. It shows all the EMG signals together with the corresponding LED's and the position of the jumpers of the dip switches S3 and S4.

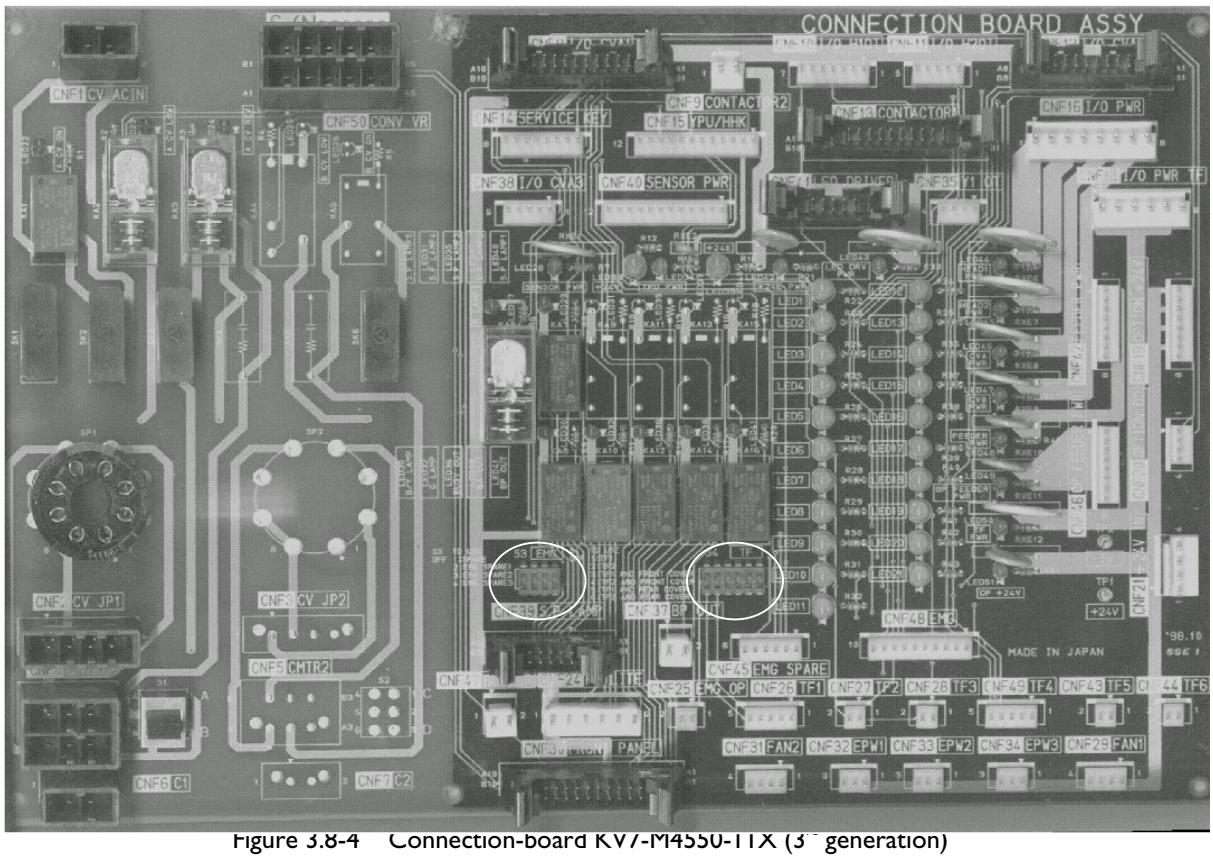


Figure 3.8-4 Connection-board KV7-M4550-11X (3rd generation)

3.9. Keyboards

The system has two devices to enter information manually, a handheld keyboard and a PC-keyboard, see figure 3.9-1.

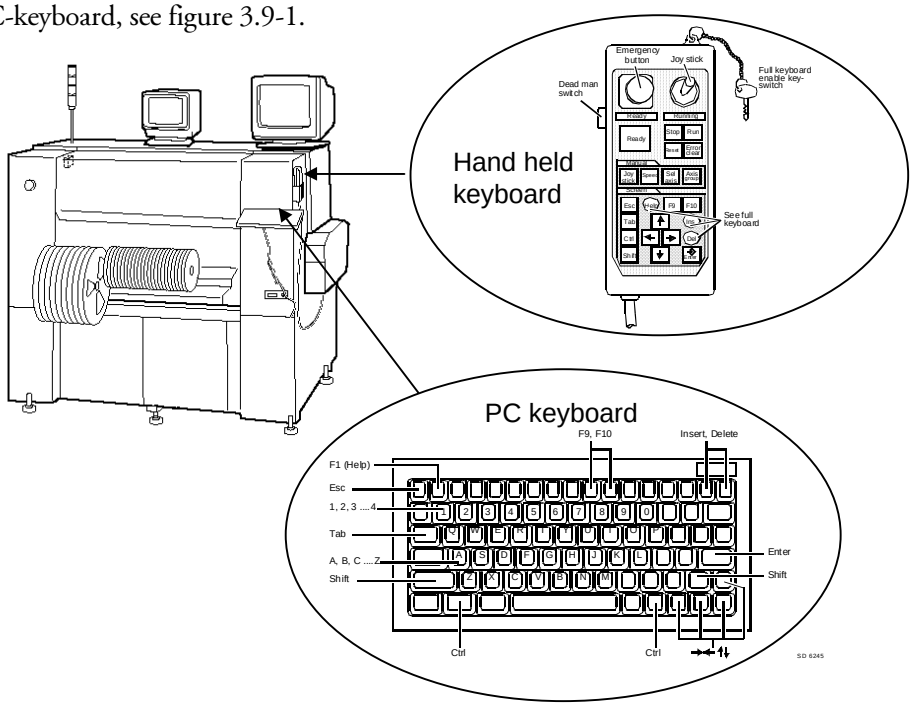


Figure 3.9-1 Topaz key-boards

3.9.1. PC-Keyboard

This keyboard is a standard (small version without keypad) PC-AT keyboard and is connected to the controller via a connector plug on the front side of the system-board in the MCX controller. This keyboard can be used for all data entering activities, it can be removed from the machine if operators are not allowed to use it.

3.9.2. Hand Held Keyboard (HHK)

This keyboard is permanently connected to the system via a cable entering the Topaz at the right side of the system. Via this keyboard simple operator functions can be performed such as RUN, STOP and RESET.

The connection between this keyboard and the MCX-controller consist of following signals:

- A serial communication line (RS232) going to the CMN1 port on the front side of the system-board in the MCX controller.
- The+24V supplied from the interconnection board.
- Emergency-switch and Ready-switch signals.
- Dead man push-button signal.

The keyboard has its own voltage converter (24V to 5V DC) and micro-processor to control the key-functions and the serial communication with the MCX-controller.

The dead-man push button is added for safety reasons, this button must be pressed continuously if a servo action while the front /rear safety covers are open.

The HHK is equipped with a so called 'full-keyboard enable key', this key is connected to the hand held keyboard by means of a chain. When the key is inserted in the key-switch on the right front cover this will enable the full keyboard. When the key is out of the key-switch no actions and commands can be given from the full keyboard. This provision is to comply to the European safety rules (CE).

NOTE: If one of the SERVICE KEY-switches (front and/or rear) of the system are activated, there is only a limited function possible with the hand-held key-board. The only actions possible are the joystick and emergency-button actions, all other buttons are disabled because of safety reasons.

3.10. Monitors

The system has two monitors (see figure 3.10-1) located at the top of the machine, one VIOS monitor (see paragraph 3.10.1) and one vision monitor (see paragraph 3.10.2). Both monitors can be shifted to the rear-side by rotating 180 degrees for easy use.

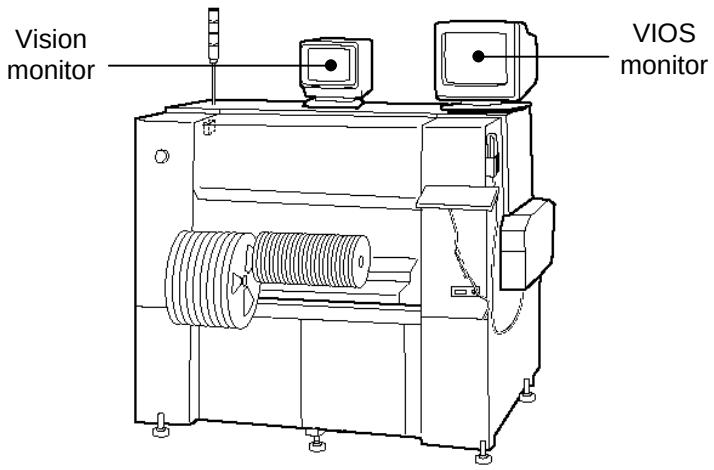


Figure 3.10-1 Topaz monitors

3.10.1. VIOS Monitor

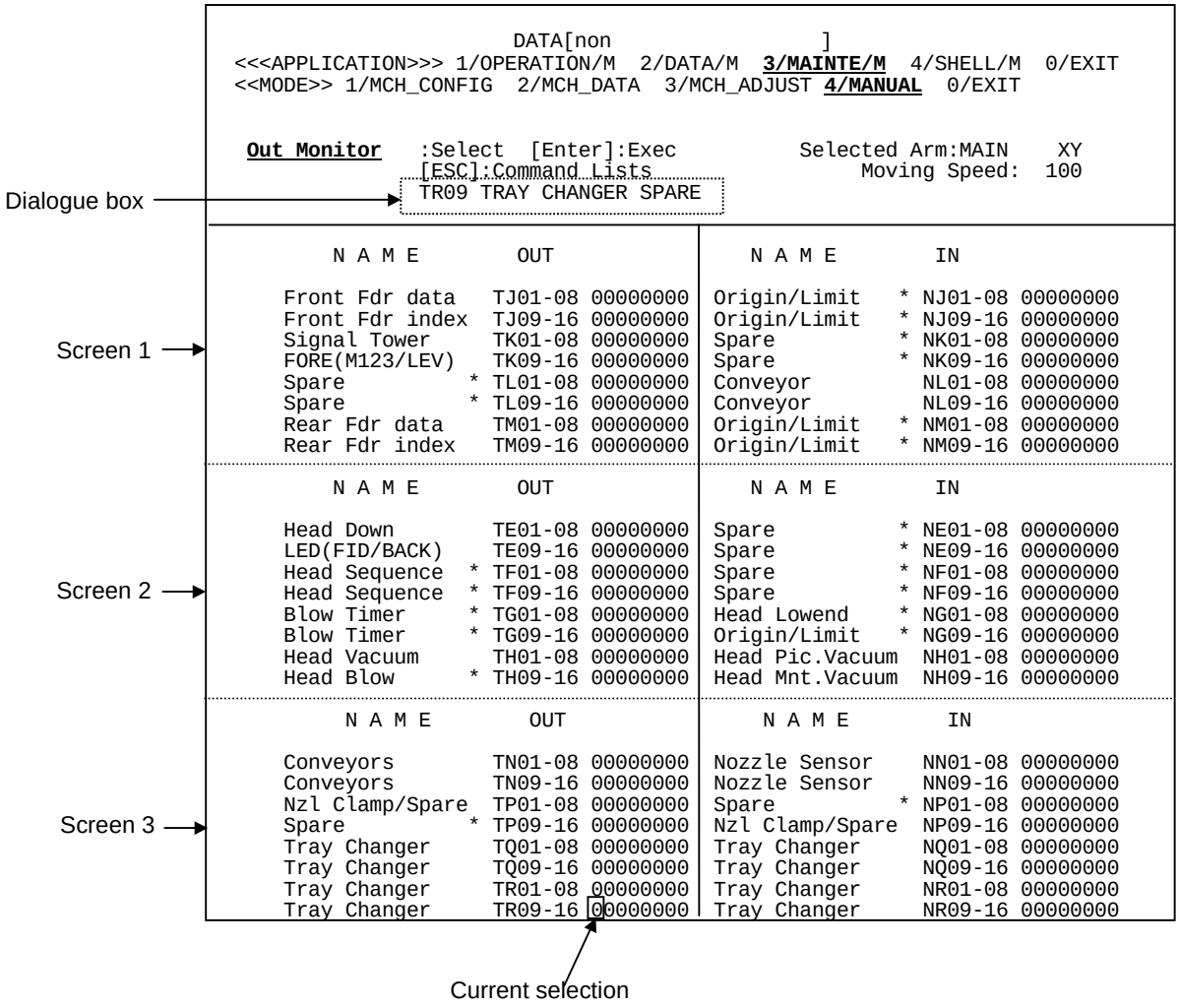
The VIOS monitor is a standard Philips VGA monitor type. In the monitor guide line booklet an explanation is given of the various adjustments as contrast, brightness, H-shift, H-size, V-shift, V-size, trapezoid, pinchusion, rotation and degauss.

3.10.2. Vision Monitor

This monitor is a 9" B/W (Black and White) Philips video monitor for displaying the vision information from the vision-board. The monitor can be ordered via the regular channels. The impedance switch at the back must be set to 75 ohm.

3.11. I/O - Signals

This paragraph will cover the basic input and output signals. In the VIOS menu a screen (I/O-monitor, see figure 3.11-1) is available that gives information of all input and output signals. All the I/O signals shown, are the actual real time conditions. The I/O-monitor screen consists of 4 screens (the picture only shows 3 !) which can be accessed by scrolling up or down. The left side of the screen shows the output monitor and the right side of the screen the input monitor.



N A M E	OUT	N A M E	IN
Front Fdr data	TJ01-08 00000000	Origin/Limit	* NJ01-08 00000000
Front Fdr index	TJ09-16 00000000	Origin/Limit	* NJ09-16 00000000
Signal Tower	TK01-08 00000000	Spare	* NK01-08 00000000
FORE(M123/LEV)	TK09-16 00000000	Spare	* NK09-16 00000000
Spare	* TL01-08 00000000	Conveyor	NL01-08 00000000
Spare	* TL09-16 00000000	Conveyor	NL09-16 00000000
Rear Fdr data	TM01-08 00000000	Origin/Limit	* NM01-08 00000000
Rear Fdr index	TM09-16 00000000	Origin/Limit	* NM09-16 00000000

N A M E	OUT	N A M E	IN
Head Down	TE01-08 00000000	Spare	* NE01-08 00000000
LED(FID/BACK)	TE09-16 00000000	Spare	* NE09-16 00000000
Head Sequence	* TF01-08 00000000	Spare	* NF01-08 00000000
Head Sequence	* TF09-16 00000000	Spare	* NF09-16 00000000
Blow Timer	* TG01-08 00000000	Head Lowend	* NG01-08 00000000
Blow Timer	* TG09-16 00000000	Origin/Limit	* NG09-16 00000000
Head Vacuum	TH01-08 00000000	Head Pic.Vacuum	NH01-08 00000000
Head Blow	* TH09-16 00000000	Head Mnt.Vacuum	NH09-16 00000000

N A M E	OUT	N A M E	IN
Conveyors	TN01-08 00000000	Nozzle Sensor	NN01-08 00000000
Conveyors	TN09-16 00000000	Nozzle Sensor	NN09-16 00000000
Nzl Clamp/Spare	TP01-08 00000000	Spare	* NP01-08 00000000
Spare	* TP09-16 00000000	Nzl Clamp/Spare	NP09-16 00000000
Tray Changer	TQ01-08 00000000	Tray Changer	NQ01-08 00000000
Tray Changer	TQ09-16 00000000	Tray Changer	NQ09-16 00000000
Tray Changer	TR01-08 00000000	Tray Changer	NR01-08 00000000
Tray Changer	TR09-16 00000000	Tray Changer	NR09-16 00000000

Figure 3.11-1 VIOS DI/DO-monitor window

A complete list of all input and output signals is given on the next pages. They are shown with the description, connection, location and relationship to other signals.

Remarks: **T**(01) stands for: OU**T**PUT signal
N(N01) stands for: I**N**PUT signal

The signal names TN01, TP01, TM09, NQ16, etc. are related to the corresponding labels on the harnesses. The DI/DO lists on the next pages shows this relation.

3.11.1. VIOS Manual Mode I/O-Monitor

Output Monitor:
In manual mode, the output monitor can be selected by accessing the following menu:
1/OPERATION/M - 4/MANUAL - D/SAVE&EXIT - D2 OUTPUT MONITOR

By placing the cursor on the desired field the description of the particular bit is shown in the dialogue box. The <ENTER> key can be used to toggle a specific bit between the active state (“1”) and the not active state (“0”).

WARNING

ONLY TRAINED CSM SERVICE ENGINEERS ARE ALLOWED TO USE THE INPUT/OUTPUT MONITOR FEATURE !.

ACTIVATING MACHINE FUNCTIONS BY MEANS OF THE OUTPUT MONITOR MAY CAUSE DAMAGE TO THE MACHINE IF NOT USED CORRECTLY.

The system will not check if an activation of an output signal will cause a dangerous situation.

Input Monitor:
In manual mode, the input monitor can be selected by accessing the following menu:
1/OPERATION/M - 4/MANUAL - D/SAVE&EXIT - D1 INPUT MONITOR

By placing the cursor on the desired field, the description of the particular bit is shown in the dialogue box. These bits cannot be manipulated because they are input bits !

3.11.2. List of OUTPUT Signals (DO's)

Following table 3.11-1 shows an overview, in alphabetical order, of all D(ata) O(utputs) used in the Topaz system.

The table combines similar outputs as follows:

TH01-8	Head1 to head8 vacuum

This means output TH01 is head 1 vacuum, TH02 is head 2 vacuum etc.

TE10+11	Spare

This means output TE10 and TE11 are spare.

TA01-16	Spare
TB01-16	Spare
TC01-16	Spare
TD01-16	Spare
TE01-8	Head1 to head8 down
TE09	Head light1(for moving) on
TE10+11	Spare
TE12	Head 1-2 slow down
TE13	Head 3-4 slow down
TE14	Head 5-6 slow down
TE15	Head 1-8 slow down
TE16	Head serial cmn ok
TF01-8	Head1 to 8 active head-sequence
TF09-13	Extended do
TF14	Head-sequence vac/mnt
TF15	Head-sequence vac.check
TF16	Head-sequence start
TG01-8	Timer set bit0 to bit7
TG09-11	Timer head-no select bit0 to bit2
TG12-14	Timer port-no select bit0 to bit2
TG15	Spare
TG16	Timer start
TH01-8	Head1 to head8 vacuum
TH09-16	Head1 to head8 blow
TJ01-8	F.feeder data1 to data8
TJ09-12	F.feeder select1 to select4
TJ13-16	Spare
TK01	Buzzer
TK02	Blue/yellow lamp
TK03	White/red lamp
TK04	Green/green lamp
TK05	Gate out
TK06	Spare
TK07	Cover lock
TK08	Ba out(smema)
TK09	Spare
TK10	Lamp11(single camera 1) on
TK11	Lamp12(single camera 2) on
TK12	Lamp13(multi camera) on
TK13-15	Brightness1 to brightness3
TK16	Spare
TL01	B.c conveyor on
TL02	B.c conveyor reverse
TL03	B.c speed low
TL04	B.c speed high
TL05	Front non-stop fdr.carriage up
TL06	Front non-stop fdr.carriage down
TL07	Front non-stop fdr.carriage forward
TL08	Front non-stop fdr.carriage backward
TL09-16	Spare
TM01-8	R.feeder data1 to data8
TM09-12	R.feeder select1 to select4
TM13-16	Spare
TN01	Main stopper
TN02	Plate push up
TN03	Locate pin1
TN04	Edge clamp
TN05	Push in
TN06	Stopper of entrance
TN07-11	Spare
TN12	Conveyor reverse
TN13	Conveyor on
TN14	Conveyor speed low
TN15+16	Spare
TP01	Nozzle station up
TP02	Nozzle station clamp
TP03+4	Spare
TP05	Rear non-stop fdr.carriage up
TP06	Rear non-stop fdr.carriage down
TP07	Rear non-stop fdr.carriage forward
TP08	Rear non-stop fdr.carriage backward
TP09	Sp. Light (single camera1) up
TP10	Sp. Light (single camera2) up
TP11	Sp. Light (single camera3) up
TP12-16	Spare
TQ01	Tray changer pallete home
TQ02	Tray changer hook forward
TQ03	Tray changer hook close
TQ04	Tray changer pallete set
TQ05	Tray changer hook backward
TQ06+7	Tray changer spare
TQ08	Ext.tc conveyor on
TQ09	Ext.tc conveyor reverse
TQ10	Tray changer door1 lock
TQ11	Tray changer door2 lock
TQ12	Tray changer door1 light
TQ13	Tray changer door2 light
TQ14+15	Tray changer spare
TQ16	Tray changer servo on
TR01-3	Ext.tc station1 to station3 vacuum
TR04-12	Tray changer spare
TR13	Ext.tc head vacuum
TR14	Tray changer spare
TR15	Ext.tc head down
TR16	Tray changer spare

Table 3.11-1 List of D(ata) O(utputs) used in the Topaz

3.11.3. List of INPUT Signals (DI's)

Following table 3.11-2 shows an overview, in alphabetical order, of all D(ata) I(nputs) used in the Topaz system.

The table handles similar inputs in the same manner as described for the outputs, refer to chapter 3.11.2.

NA01-16	Spare
NB01-16	Spare
NC01-16	Spare
ND01-16	Spare
NE01-8	Head1 to 8 memory active head-sequence
NE09-14	Extended di
NE15	Head sequence finish
NE16	Timer busy
NF01-16	Spare
NG01-8	No 1 to no8 head up/down
NG09	X-axis origin
NG10	Spare
NG11	R-axis origin
NG12	Nozzle down
NG13+14	Spare
NG15	X-axis over travel
NG16	Spare
NH01-8	Head1 to head8 pick up judgment
NH09-16	Head1 to head8 mount judgment
NJ01	Y-axis origin
NJ02+3	Spare
NJ04	Relay spare
NJ05	Y-axis over travel
NJ06	Spare
NJ07	Front feeder lock 2
NJ08	Front feeder-carriage lock
NJ09	Invalid fullkey board service key
NJ10	Front feeder lock 1
NJ11	Front area
NJ12	Gate in
NJ13	Release cover emergency
NJ14	Contactor ok
NJ15	Count reset
NJ16	Can't use
NK01-8	Nozzle 17 to 24
NK09	Front non-stop fdr.carriage detect switch
NK10	Front non-stop fdr.carriage detect upper
NK11	Front non-stop fdr.carriage detect forward
NK12-16	Spare
NL01	Sub position1 of ent.
NL02	Conveyor entrance
NL03	Conveyor exit
NL04	Sub position2 of ent.
NL05	Dump station
NL06	Spare
NL07+8	Can't use
NL09	Set position
NL10	Locate pin1
NL12	Locate pin2
NL13	Spare
NL14	Rear nozzle station clamp
NL15	Push up plate fixed
NL16	Spare
NM01	Spare
NM02	W-axis origin
NM03+4	Spare
NM05	2nd limit spare
NM06	Spare
NM07	Rear feeder lock 2
NM08	Rear feeder-carriage lock
NM09	Air pressure
NM10	Rear feeder lock 1
NM11	Rear area
NM12+13	Spare
NM14	Smema discrimination
NM15	Smema ba in
NM16	Spare
NN01-16	Nozzle 1 to nozzle 16
NP01	Rear non-stop fdr.carriage detect switch
NP02	Rear non-stop fdr.carriage detect upper
NP03	Rear non-stop fdr.carriage detect forward
NP04	Sp. Light (single camera1) up
NP05	Spare
NP06	Sp. Light (single camera1) down
NP07+8	Can't use
NP09	Sp. Light (single camera2) up
NP10	Sp. Light (single camera2) down
NP11	Sp. Light (single camera3) up
NP12	Sp. Light (single camera3) down
NP13+14	Front nozzle station clamp
NP15	Nozzle station up
NP16	Nozzle station down
NQ01	Tray changer pallet origin
NQ02+3	Tray changer hook open + close
NQ04	Tray changer pallet set
NQ05	Tray changer relay spare
NQ06+7	Tray changer spare
NQ08	Tray changer door1 interlock
NQ09	Tray changer door2 interlock
NQ10	Rack1 in(ext.tc),latch open
NQ11	Rack2 in(ext.tc),latch close
NQ12	Ext.tc head beam
NQ13	Ext.tc head vacuum
NQ14	Tray changer spare
NQ15	Ext.tc head lower
NQ16	Tray changer spare
NR01-3	Ext.tc station1 to station3 vacuum
NR04	Tray changer hook safety(zpos)
NR05+6	Autotc-s hook forward + backward
NR07	Tc board discrimination
NR08	Tray changer +24v ok
NR09+10	Tray changer door1 + door2 sw
NR11	Ext.tc conveyor entrance
NR12	Ext.tc pcb check position
NR13	Ext.tc conveyor exit
NR14	Ext.tc select switch
NR15	Ext.tc pcb check ok
NR16	Ext.tc w axis origin

Table 3.11-1 List of D(ata) O(utputs) used in the Topaz

CHAPTER 4 Power and Safety Circuits

4.1. Introduction

The Topaz has a number of safety circuits and power supplies. In the first part of this chapter the safety circuitry will be discussed. the second part will handle the various power supplies which are used in the system. Detailed schematics can be found in chapter 14 of this manual.

4.2. Safety Circuit

4.2.1. Description

The safety interlock circuit of the Topaz consists out of a number of switches and relays contacts. These switches or contacts are activated during an unsafe situation of the machine. Examples are : open covers, over-travel, low voltages, low air, over-current, activation of the EMG. switches. Figure 4-1shows the safety circuit diagram with the various safety switches and relays contacts. On the next page a simplified drawing is made of this circuit.

The following situations can activate an emergency situation which causes an immediate stop of all movements inside the machine:

- Opening of one of the covers during running of the machine
- The over-travel (OT) signal indicates a movement of one of the axes beyond the soft limit range.
- Low air pressure.
- Activation of one of the EMERGENCY switches which are located at the front and the rear side of the machine and at the hand-held key-board.
- Feeder floating signal (if installed), indicating a wrongly installed feeder.
- Low voltages.
- Over-current in one of the motor driver boards.

In most cases the controller will display an ERROR code with a short description of the emergency cause on the VIOS monitor. In paragraph 1.4.3 a list of possible causes is given. If the Tray Changer is installed also emergency conditions from this device can stop the machine.

Re-activation of the system is only possible after resolving the emergency cause and pressing the READY-switch at the hand-held keyboard.

WARNING

When working at the systems safety circuit make sure to take all the necessary safety precautions to avoid possible danger.

4.2.2. Safety Circuit

The detailed safety diagrams of the system can be found in Chapter 14. A more simplified diagram is shown in figure 4-1 and figure 4-2. All signals from and to the various switches and sensors are going via the connection-board. On this connection-board various LED's are mounted which indicate the status of the Over Travel (OT) and emergency (EMG) signals. Also the 24VDC from the GS21 power supply is distributed via this board.

From April 2000 onwards the Topaz system is equipped with a 3rd generation connection-board. The 2nd generation connection-board has been replaced by this new version.

2nd generation connection board KU1-M4550-00X :

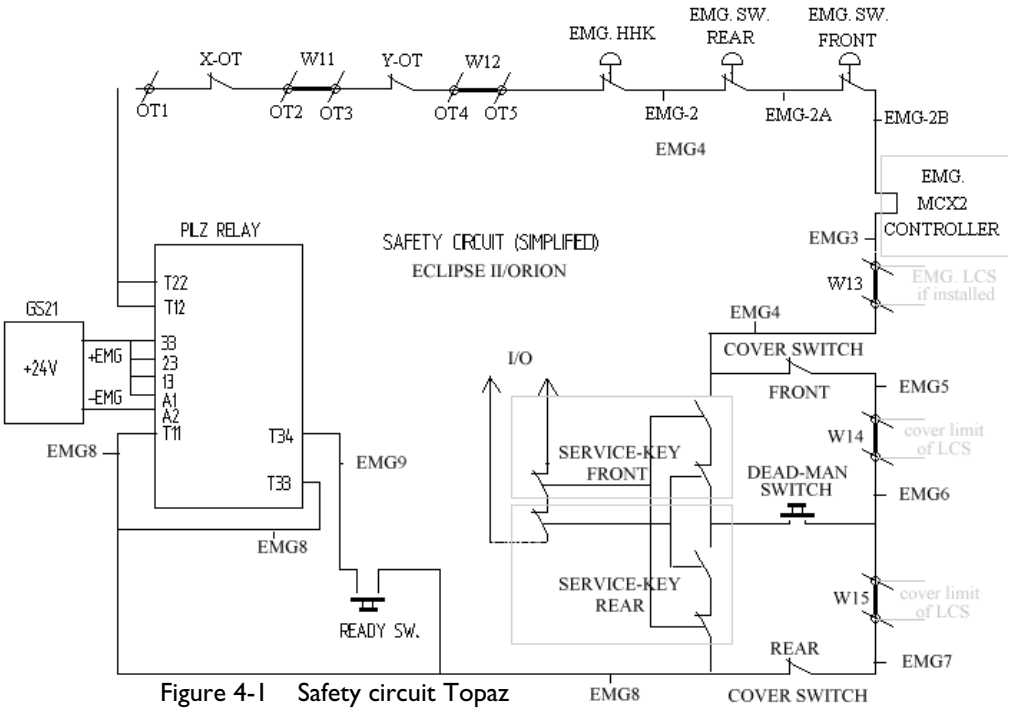


Figure 4-1 Safety circuit Topaz

	Colour	Mark	Condition for LED ON
1	Yellow	LED1	EMG circuit of HEAD I/O-1 board Over Travel is OK
2	Yellow	LED2	EMG circuit of HEAD I/O-2 board Over Travel is OK
3	Yellow	LED3	EMG circuit of CONVEYOR I/O-1 board Over Travel is OK
4	Yellow	LED4	EMG circuit of CONVEYOR I/O-2 board Over Travel is OK
5	Yellow	LED5	EMG circuit of optional EMG and HHK EMG STOP is OK
6	Yellow	LED6	EMG circuit of CONVEYOR I/O-1 board EMG STOP is OK
7	Yellow	LED7	EMG circuit of CONVEYOR I/O-2 board EMG STOP & MCX OK
8	Yellow	LED8	EMG circuit of Tray Changer is OK (NOT for Sapphire)
9	Yellow	LED9	EMG circuit of FRONT cover stop is OK
10	Yellow	LED10	EMG circuit of Tray Changer front cover OK (NOT for Sapphire)
11	Yellow	LED11	EMG circuit of REAR cover stop is OK
12	Yellow	LED12	EMG circuit of Tray Changer rear cover OK (NOT for Sapphire)
13	Green	+24VA	DC24V input at CNF22 is OK
14	Green	+24VB	DC24V input at CNF21 is OK
15	Green	+24S	Non
16	Green	+EMG	DC24V input at CNF23 is OK
17	Green	+24E	DC24V of EMG safety is OK (only when Servo is switched on)

Table 4-1 Meaning of LED's on the 2nd generation connection-board

Note 1: When LED1 to LED4 are ON, and the LED5 to LED12 are OFF, then the HHK EMG STOP (LED5) is NOT GOOD (NG). This means that there is something wrong with the HHK circuitry.

Note 2: As can be seen from the diagram figure 4-1, it is only possible to have a cover open at one side at the time. It is also needed to press continuously the dead man push-button in order to keep the servo system active.

3nd generation connection board KV7-M4550-11X :

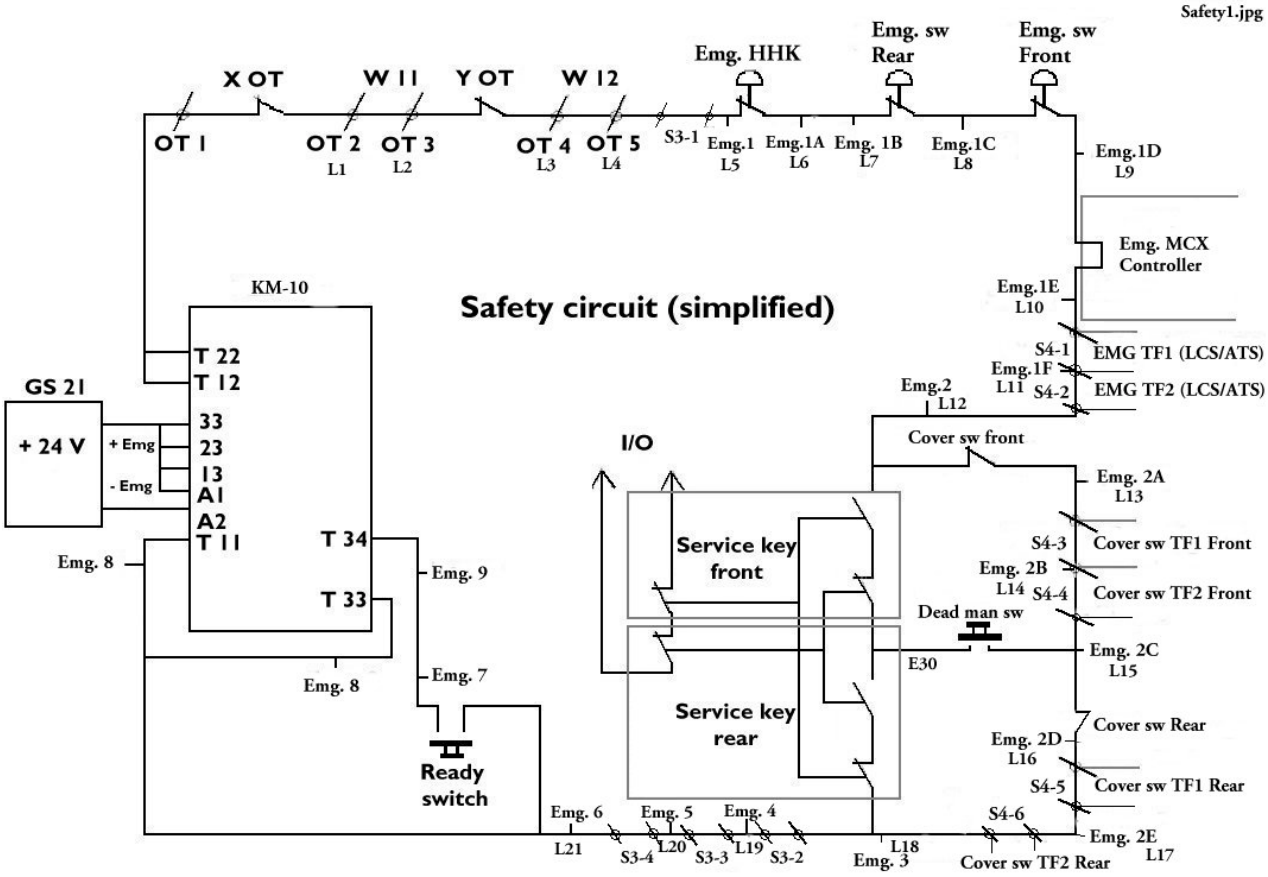


Figure 4-2 Revised safety circuit Topaz

Led no.	Colour	Mark	Condition for LED ON
1	Yellow	LED1	X-1 over travel is OK
2	Yellow	LED2	Not used
3	Yellow	LED3	Y-1 over travel is OK
4	Yellow	LED4	Not used
5	Yellow	LED5	Not used (on)
6	Yellow	LED6	HHK emergency stop is OK
7	Yellow	LED7	Not used
8	Yellow	LED8	Not used (offf)
9	Yellow	LED9	Not used (off)
10	Yellow	LED10	Controller & EMG front/rear is OK
11	Yellow	LED11	Tray feeder emergency stop 1 is OK
12	Yellow	LED12	Tray feeder emergency stop 2 is OK
13	Yellow	LED13	Cover stop of front side is OK
14	Yellow	LED14	Tray feeder cover stop of front side 1 is OK
15	Yellow	LED15	Tray feeder cover stop of front side 2 is OK
16	Yellow	LED16	Cover stop of rear side is OK
17	Yellow	LED17	Tray feeder cover stop of rear side 1 is OK
18	Yellow	LED18	Tray feeder cover stop of rear side 2 is OK
19	Yellow	LED19	Spare 1 emergency circuit is OK
20	Yellow	LED20	Spare 2 emergency circuit is OK
21	Yellow	LED21	Spare 3 emergency circuit is OK

Table 4-2 Meaning of LED's on the 3rd generation connection-board

Note 1: When LED1 to LED5 are ON, and the LED6 to LED21 are OFF, then the HHK EMG STOP (LED6) is NOT GOOD (NG). This means that there is something wrong with the HHK circuitry.

Note 2: As can be seen from the diagram figure 4-2, it is only possible to have a cover open at one side at the time. It is also needed to press continuously the dead man push-button in order to keep the servo system active.

4.3. Power Circuits

4.3.1. Description

In the Topaz two transformers are used to supply power to the various parts of the machine, TC11 and TM11. Refer to chapter 14 for the complete power circuit diagram.

Transformer TC11 is used for the logic circuits and converts the 3-phase input voltage to a 2-phase 200/220V supply voltage. TC11 uses following taps:

Tap U10: 220 volts; this voltage is used for the two monitors via QF21 (2A). Make sure to set the correct tap (100V or 220 V) when installing the monitors !

Tap U20: 200 volts; this voltage is, via QF22 (5A), used for the GS21 power supply which feeds the I/O and EMG circuitry. It is also used for the circuit logic in the MCX controller.

Transformer TM11 supplies the motor drivers boards and converts the voltage level but keeps it a 3-phase supply voltage. The output of the TM11 transformer is 3- phase 200V AC and is fed, via QF31 (10A) and the emergency power relays KM11 and KM12, to the 282V D(river)-power supply in the MCX controller. Also the conveyor belt motors and the connection board are fed, via QF32 (2A), by this transformer.

The Power supply unit GS21 supplies 24V to the I/O and emergency circuits in the Topaz. The GS21 is located next to the transformers TM11 and TC11 in the power box at the back of the Topaz. For more information about this power supply please refer to chapter 4.5.4.

Note: Make sure to set the correct input voltage taps when installing the machine. see chapter 3 , for the correct settings.

WARNING

Only trained technical personnel is allowed to work in the power section of the machine. Take care to take the necessary actions to avoid dangerous situations. Switch off the mains power when working in the mains power box.

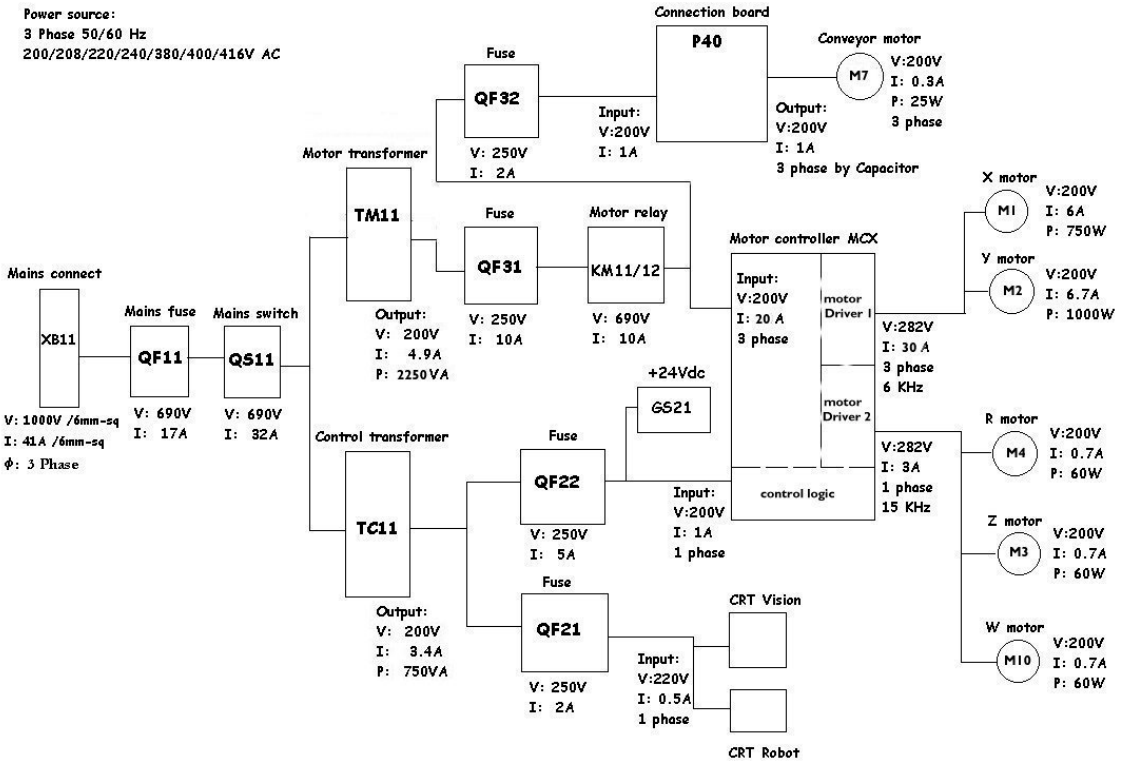


Figure 4-3 Power rating diagram Topaz system PA1309/10
Figures given are the maximum ratings of the individual items

4.3.2. 5V /12V Power Supply MCX Box

In the MCX controller a TDK MRM270 power supply is used to supply +5V, +12V and –12V. This power supply is located at the left side of the MCX controller box, please refer to figure 4-4. The lay-out of this power supply is shown in the figure 4-5.

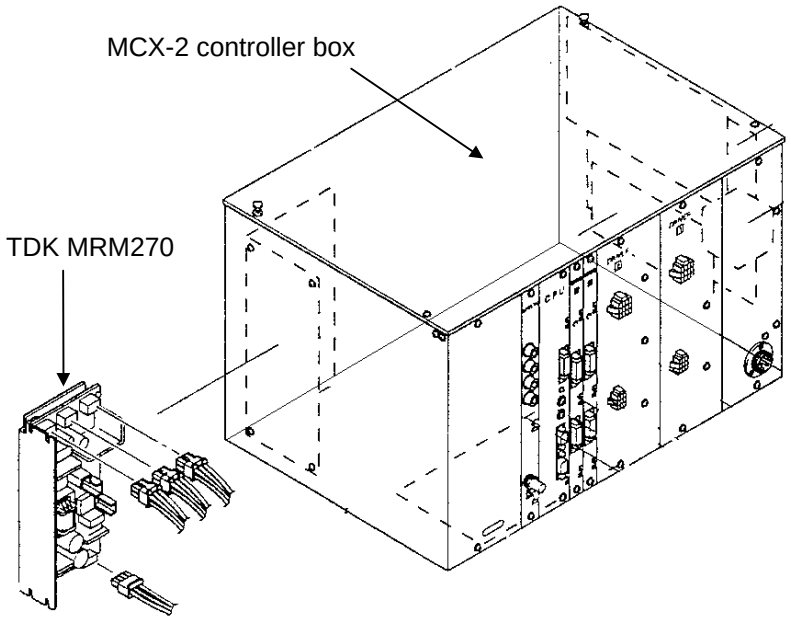


Figure 4-4 +5/+12/-12V power supply location

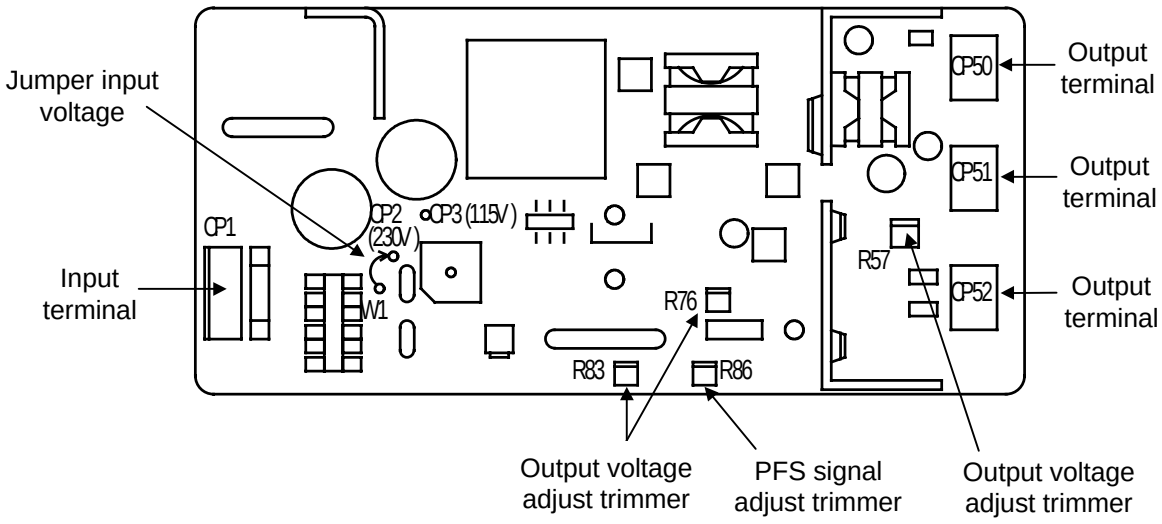


Figure 4-5 Power supply PCB layout

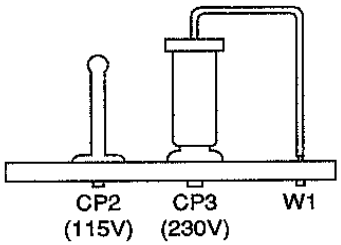
The following connectors are available:

CP1: This is the input AC (L,N,FG) terminal, make sure to connect this to the 200/230V single phase line while the ground wire is connected to the case.

CP50-52: This is the output of V1(+5V), V2(+12V) and V3(-12V). All three voltages are connected to the load as much as the DC common output (0V). Furthermore the power failure signal (PFS) is output at this terminal, however this DC output monitor signal is not used.

Following jumpers are available:

Jumper W1-CP2-CP3 is to set the input voltage to either 115V or 230V. for the Topaz the jumper should be set to 230V which means the jumper wire is connected from W1 to-CP3, see figure 4-6. Make sure to check the input voltage setting when replacing the power supply.



The following adjustments can be done:

The -12V (V3) adjustment is done by R57, adjust to –12V +/-0.5V.
The +12V (V2) adjustment is done by R72, adjust to +12V +/-0.25V.
The +5V (V1) adjustment is done by R83, adjust to +5V +/-0.1V.
The power failure signal adjustment is factory adjusted.

4.3.3. 24V I/O and Emergency Power Supply (GS21)

The 24V power supply GS21 is of the type HY248R5GN which can deliver an output current of max. 8.5A. The AC input voltage of this power supply is factory set to 220VAC.

At the rear side of this power supply the output voltage can be adjusted by means of a potentiometer (V.adj), please refer to figure 4-7. Adjust the voltage to 24V±0.25.

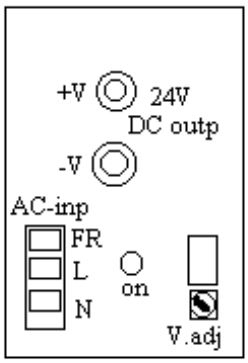


Figure 4-7 Back GS21

The power supply is located in the power box at the rear side of the system next to the two mains transformers TM11 and TC11.

4.3.4. D - Power Assembly (282V Power)

The D-power assy rectifies the 3-phase 200VAC power and supplies 282VDC to the driver boards. The assembly consists out of the D-power-board itself and the capacitor CAP1 which is located at the right-side back corner of the MCX-2 controller box, see figure 4-8 below.

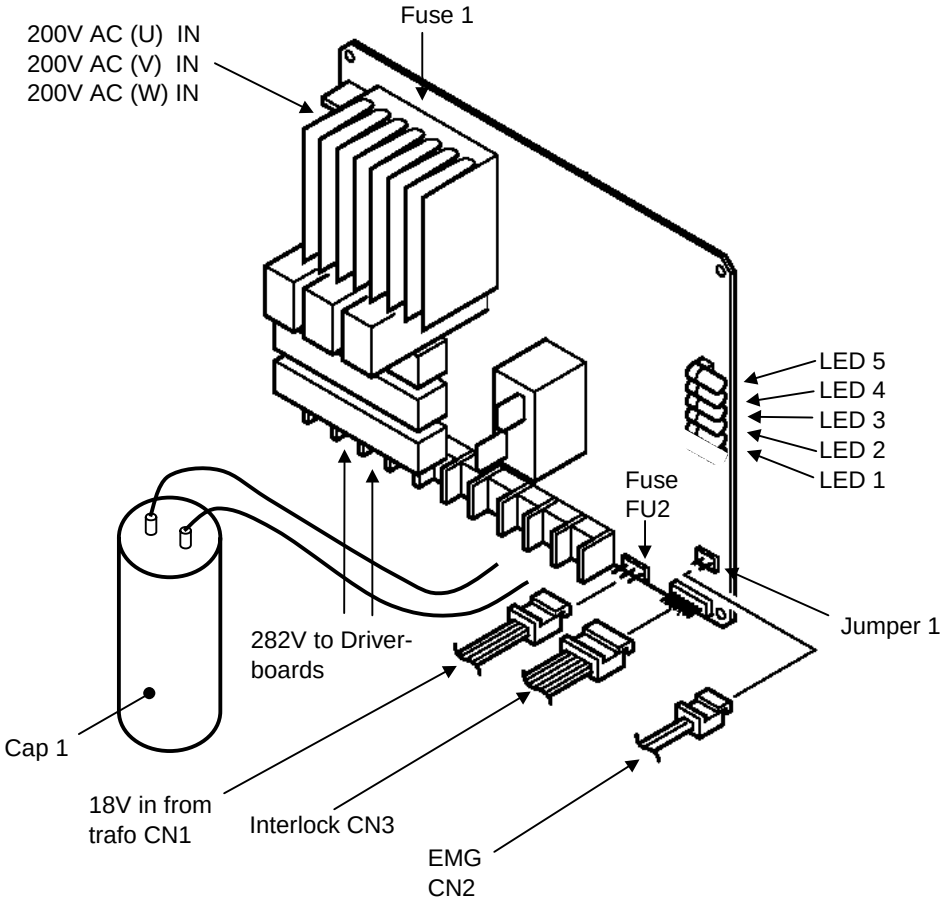


Figure 4-8 D(river) power assy

The following circuits can be distinguished:

12V reference circuit:
The reference circuit receives a 18VAC voltage (CN2) from a separate transormer inside the MCX-2 box. The 18VAC is protected by a fuse FU2 of 0.3 Amp. After rectifying a 12VDC voltage is generated which is used for the controlling circuitry. The LED-1 (green) will be lit, as long as the temperature is OK.

Inrush protection circuit:
This circuit inhibits a high inrush current when the 200VAC is switched on. After some time (measured via the input voltage period) the serial resistors R1-R3 are shorted.

Phase check circuit:
This circuit checks the 3 phases of the input voltage. If not OK, a signal will be send to the Servo card, via the INTLCK-connector CN3 and the LED-2 (green) will be OFF. There is a jumper selection on the board to select 1-phase (jumper on position (2-3) or 3-phase (jumper on position 1-2) input voltage. In the GEM-line systems we use always the 3-phase input voltage, so the jumper is always set to 1-2. (part of the phase-check circuit), the jumper image is shown in figure 3.6-3.

Under voltage detection:
This circuit checks if the Input voltage is active AND if the output voltage is lower then 186VDC. If this is the case then LED-3 (orange) will be OFF and the servo- board will be informed via the INTLCK-connector CN3.

Over voltage detection:
This circuit checks if the output is over 414VDC. If this is the case LED-4 (red) will lit as long as the 12V of the ref. circuit is on. The servo-board will be informed AND an EMG signal will be generated (Not used).

Temperature sensing:
The temperature inside the controller is continuously sensed. If the temperature is more than 65°C, LED-1 (green) will be OFF while a signal is sent to the servo-board.

Drive power charging:
An indication, LED-5, is made to see when the capacitor is charging-up.

As mentioned before the INTERLOCK connector which is going to the servo-board (to switch off the D.- power and stops the motors) has the following 4 signals:

Interlock CN3	Effect	LED	Conditions for close
INT1 pos.1-2	Voltage low	3	Output over 186V DC
INT2 pos.3-4	Phase loss	2	3-phase AC input is active (JP1:1-2) OR only 1-phase AC input is active (JP1:2-3)
INT3 pos.5-6 EMG CN2 pos.1-2	Temp./voltage Over flow	4 1	Temp. is under 65 degrees Celcius AND the ouput is under 414V DC.

Please refer to Chapter 14 for the circuit diagram of the D-power assy.

4.3.5. Measuring and Adjusting Data

MCX controller box

The voltages inside the MCX controller box can be measured at the mother-board connectors CN5,6 and 9 near the LED indicators, follow the next procedure to do so.

- Loosen the MCX-2 box so it can slide out of the machine.
- Loosen the two top-cover screws.
- Remove the left front cover (at the motherboard LED's)
- Some connectors can now be seen, see mother board (Chapter 3)
- Measure at connectors CN9 or CN11 (behind the LED's) the following voltages:

CN9:	+5V ± 0.1V	pins 1,2
CN9:	+12V ± 0.25V	pins 3,4
CN9:	GND	pins 5,6,7
CN5:	-12V ± 0.5V	pin 3
CN5:	+12V ± 0.25V	pins 4,5
CN6:	+5V ± 0.1V	pins 1,2,3,4
CN6:	GND	pins 5,6,7,8

- If the measured voltage is not within the above given spec's they can be adjusted with the potentiometers as is indicated in figure 4-5.
- Reinstall the front and top-cover after the adjustment is done
- Push MCX controller box back into the machine and secure it.

WARNING

Make sure to check the +5, +12, and -12 Volt power supplies inside the MCX controller at regular intervals (each 3 months). Especially the +12 and -12 Volts are important for the servo systems because they are used for the IC's in the servo control circuitry

GS21 – 24V power supply

The voltage of the GS21 power supply can be measured at the power supply terminals. Carry out following actions:

- Open the power-box doors at the rear side of the system.
- Locate the GS21 power-supply and measure at the terminals the following voltage: +24V ± 0.5V.
- If the voltage is not OK, adjust the level with potentiometer RV1 (fig 4-7).
- Close the power-box doors.

4.3.6. Performance Check and Trouble Shooting

No performance check is needed for the power supplies of the system. All power supplies have a LED indication (green light) when the voltage is ok. This can be handy in case of trouble shooting some problems. Make sure that the GOOD-signal (POWER NG) is not activated. All servo boards are interconnected with an EMG- signal, this signal gives and EMERGENCY error when active.

4.3.7. Maintenance Instructions

- Check the voltages of all power supply's each 3 months and adjust them if necessary.
- Check and clean the two fans inside the MCX-2 controller box.
- Check all cabling and harnesses from and to the power-supply's (check for bad connections and discoloured wires).
- Check all emergency switches and harnesses (e.g. EMG-cabling) on their functionality.
- Check all fuses in the mains circuit.

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CHAPTER 5 Vacuum and Pneumatic Systems

5.1. Vacuum Systems

5.1.1. Introduction

This chapter describes the vacuum systems which are used in the Topaz and the tray changer (TC). How to set vacuum levels of the machine like pickup vacuum, mount vacuum etc. is described in chapter 11 “machine calibration”.

5.1.2. Functional Description

The vacuum pumps of the Topaz and TC are based on the use of ejectors. An ejector uses compressed air to create a vacuum. Each head of the Topaz has its own ejector which can be switched on and off via an air-valve inside the ejector pump. As can be seen in the total air-circuit diagram in chapter 14, the compressed air for the vacuum section is fed from the regulator and sent via a hose and a coupling to the ejector assy.

The vacuum level is sensed at the head I/O-1 board, please refer to the Head I/O-board logic diagram in chapter 3. The ejector can be switched on/off via the signals TH01 and TH02 on the I/O-1 head board.

The TC vacuum system uses 2 ejector units, item-34, on the shuttle (please refer to the spare-parts drawings in chapter 13.8 “Traverser assy”) and one ejector + valve (YV11) for the pick-up head located on the head. The vacuum on the shuttle pads can be switched on via the valves TR01 and TR02 (item-30 in chapter 13.8). The vacuum on the head can be switched by signal TR13 (YV11)

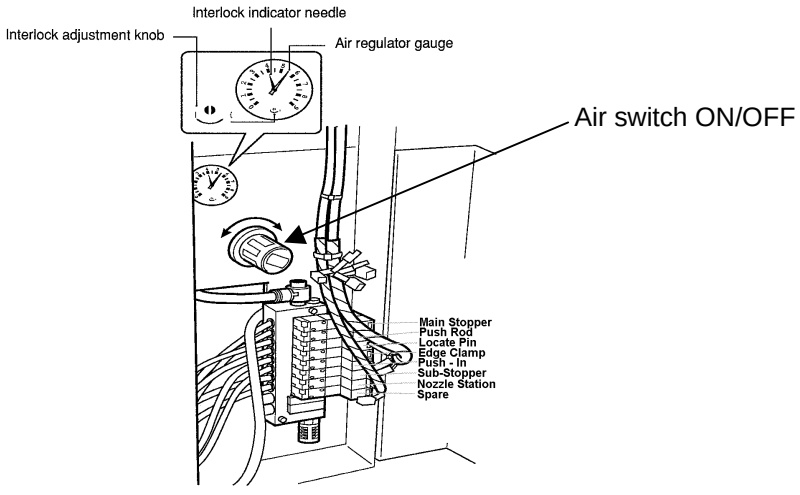


Figure 5-1 Valves

The Topaz has two separate air pressure regulators. One for the ejectors and one for the air solenoids of the system. The air pressure regulator for the vacuum-line is located behind the lower left panel at the left side of the machine.

5.1.3. Air Supply Unit

The air supply unit is located inside the lower right panel on the rear side of the machine, along with a pressure regulator. The air pressure regulator must be set correctly in order to provide optimum air pressure for the vacuum ejectors and pneumatic devices. Before making the setting, be sure that the pressure from the primary air supply is between 0.6 and 0.7 MPa.

5.1.4. Air Pressure Regulator

The air pressure regulator can be adjusted with the valve control knob as follows:

Open the lower right panel on the rear side of the machine.
The pressure regulator, valve control knob and pressure meter are located inside the panel.
Adjust the air pressure. Turn the valve control knob so that the air pressure is set between 0.45 to 0.5 MPa (4.6 to 5.1 kgf/cm2).

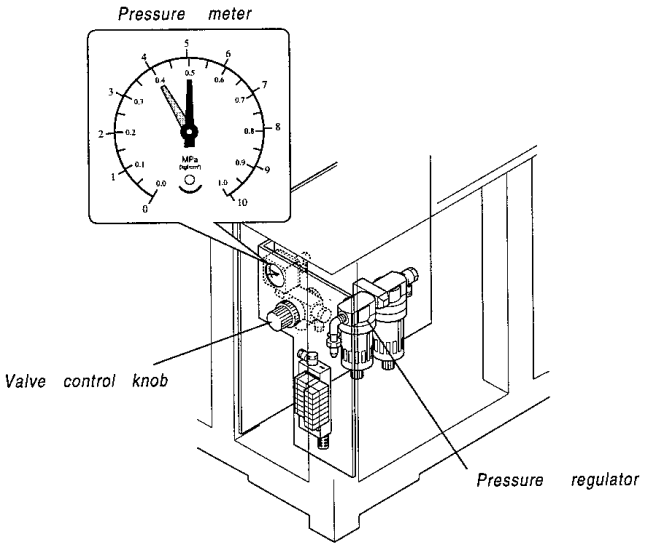


Figure 5-2 Pressure meter

WARNING

If this pressure setting is not correct, the vacuum ejector cannot function adequately and air cylinders become unstable. Be sure that the pressure is set within the specified range.

5.1.5. Pressure-Drop Detection Level

If the air supply pressure drops below this adjustable level, the pressure-drop detection switch triggers an emergency stop and inhibits the movement of all axes. At the same time, the message below appears on the operation monitor.

> E 0806
>
> QUICK STOP ACTIVE “NM09 AIR PRESSURE SW”.
> QUICK STOP FUNCTION for safety is now active.
> To continue, please check the supplied air

To adjust the setting for pressure-drop detection, proceed as follows:

- Open the lower right panel on the rear side of the machine. The pressure meter is located over the valve control knob.
- Adjust the level for pressure-drop detection.
- Turn the adjustment screw in the meter with a small slotted screwdriver so that the needle (red) is set at 0.4 to 0.45 MPa (4 to 4.5 kgf/cm2).

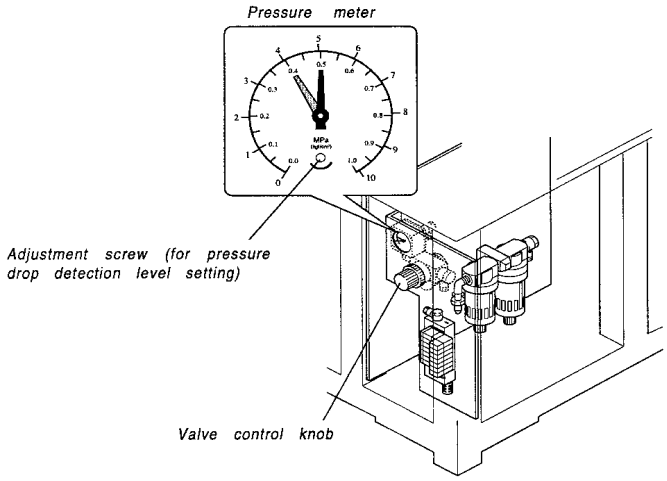


Figure 5-3 Air pressure-drop level setting

WARNING

If this pressure setting is not correct, the vacuum ejector cannot function adequately and air cylinders become unstable. Be sure that the pressure is set within the specified range.

5.1.6. Measurement and Adjusting Vacuum Levels

The measurement of the vacuum level is done via vacuum sensors (transducers) which are located on the I/O-1 head assy board. Each head has its own sensor and can be adjusted and calibrated independent from each other. For the Adjustment of the sensing circuit please refer to the calibration chapter 11.

5.1.7. Performance Check and Trouble Shooting

In order to get a correct vacuum level from each ejector, make sure that the air-pressure is at a correct level (>5.5 bar). Make also sure that the hoses to and from the ejector are not contaminated.

5.1.8. Maintenance Instructions

Each ejector has its own air-filter which needs to be checked at regular intervals (500 Hours). If the filter is contaminated it is advisable to replace it by a new one.

5.2. Pneumatic Systems

5.2.1. Introduction

This chapter describes the electrical interface of the pneumatic system in the Topaz and Tray Changer.

5.2.2. Functional Description

The Topaz contains a number of pneumatic solenoid valves and cylinders. The air solenoid valves control the air flow to certain air pressure lines. The pneumatic driven cylinders are used for the locate-pins, push-up pins , push-in, edge clamps and head-down movement.
The air solenoid valves are controlled electrically by a 24V signal coming from the I/O-boards. The air cylinders are activated by air pressure which are controlled by electrical solenoids. The pneumatic cylinders are controlled by air solenoid valves.

5.2.3. Topaz

The air solenoid valves are controlled by the I/O-boards inside the machine.
In chapter 14 the interconnections are shown between the conveyor I/O's and the various valves.

5.2.4. Tray Changer (TC)

The air solenoid valves of the Tray Changer are controlled by the I/O-conveyor board inside the Tray changer. For the connections between the I/O-board and the various solenoids please refer to the overall TC interconnect diagram in chapter 14.
The air pressure for the Tray Changer air valves is supplied via the main machine.

5.2.5. Tape Feeders

The tape feeders do not have air solenoids valves so they do not contain electrical connections.

5.2.6. Automatic Tray Stacker

The automatic tray stackers do have air valves which are supplied via the main machine as well as the electrical signals required.

5.2.7. FES/SVS

The compressed air used in the FES and SVS systems are supplied via the machine (connected via the interface box).

5.2.8. Measuring and Adjusting

Check and, if necessary, adjust at regular intervals (quarterly) the 24 volts which is used to control the various valves of the pneumatic system.
The two power supply's GS21 and GS22 are located at the left lower rear side of the system.

5.2.9. Performance Checks and Trouble Shooting

No specific actions are done for the performance check. If some valves are not working please first check the 24 volt power supply, then check if the I/O signal is ok, check this by activating manually the I/O signal via the manual I/O setting screen.

5.2.10. Maintenance Actions

No specific maintenance actions, besides the 24V checking, are necessary.

5.3. Exchanging Head Ejectors, Valves and Base

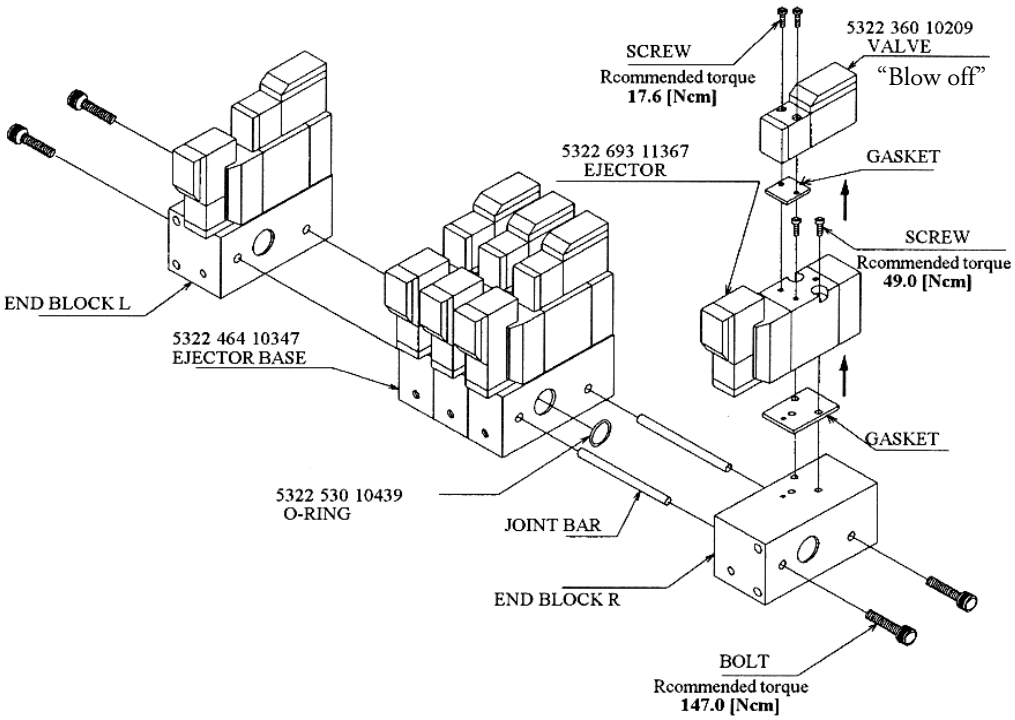
This chapter describes how to replace the head ejectors and valves.

5.3.1. Exchanging the Head Ejector and/or Valves

Blow off valve replacement

To replace the blow off valves on top of the ejector in the head-assy refer to figure 5-4 and proceed as follows:

1. Loosen the two screws on top of the valve.
2. Remove the valve in the direction of the arrow.
3. Install the new valve and take care about the direction of the gasket.
4. Tighten the two screws with a torque of 17.6 Ncm.



Ejector replacement

To replace the ejector itself refer to figure 5-4 and proceed as follows:

1. Remove the valve on top of the ejector by following steps 1 and 2 of the previous procedure "Valve replacement".
2. Remove the two screws holding the ejector to the ejector base/end-block.
3. Remove the ejector by moving it in the direction of the arrow.
4. Install the new ejector and take care about the direction of the gasket.
5. Tighten the two screws with a torque of 49.0 Ncm.
6. Mount the valve on top of the ejector by following steps 3 and 4 of the previous procedure "Valve replacement".

Base replacement
To replace the base of the ejector itself refer to figure 5-4 and proceed as follows:
1. Loosen the two screws in the left or right end-block.
2. Remove the applicable end-block and ejector base.
3. Remove the valve and ejector on top of the ejector base or end-block by following steps 1 to 3 of the procedure "Ejector replacement".
4. Install the removed ejector and valve onto the new ejector-base by following steps 4 to 6 of the procedure "Ejector replacement".
5. Install the ejector-base and end-block while taking care of the O-ring.
6. Tighten the bolts with a torque of 147.0 Ncm.

REMARK: If there is a need to replace the end-blocks separate code numbers are available in the spare parts list.

CAUTION

1. Disconnect the power and air supply prior to replacing the valves.
2. Confirm the torque of each removed bolt prior to reconnecting air and power.
3. Too much torque may damage the plastic ejector base !

5.3.2. Exchanging the Head Up/Down, Slow Valves and Valve Base

Up/Down Valve replacement
To replace the valves on the head-assy refer to figure 5-5 and proceed as follows:
1. Loosen the two screws on top of the up/down valve.
2. Remove the valve in the direction of the arrow.
3. Install the new valve and take care about the direction of the gasket.
4. Tighten the two screws with a torque of 17.6 Ncm.

Slow Valve replacement
To replace the valves on the head-assy refer to figure 5-5 and proceed as follows:
1. Loosen the two screws on top of the up/down valve.
2. Remove the valve in the direction of the arrow.
3. Install the new valve and take care about the direction of the gasket.
4. Tighten the two screws with a torque of 17.6 Ncm.

Valve base replacement
To replace the valve base on the head-assy refer to figure 5-5 and proceed as follows:
1. Loosen the two screws in the left or right end-block.
2. Remove the applicable end-block and valve-base.
3. Remove the valves on the valve-base by following steps 1 and 2 of the procedures "Up/Down valve replacement" and "Slow valve replacement".

4. Install the removed valves onto the new valve-base by following steps 3 and 4 the procedures “Up/Down valve replacement” and “Slow valve replacement”.
5. Install the valve-base and end-blocks while taking care of the O-rings.
6. Tighten the bolts with a torque of 147.0 Ncm.

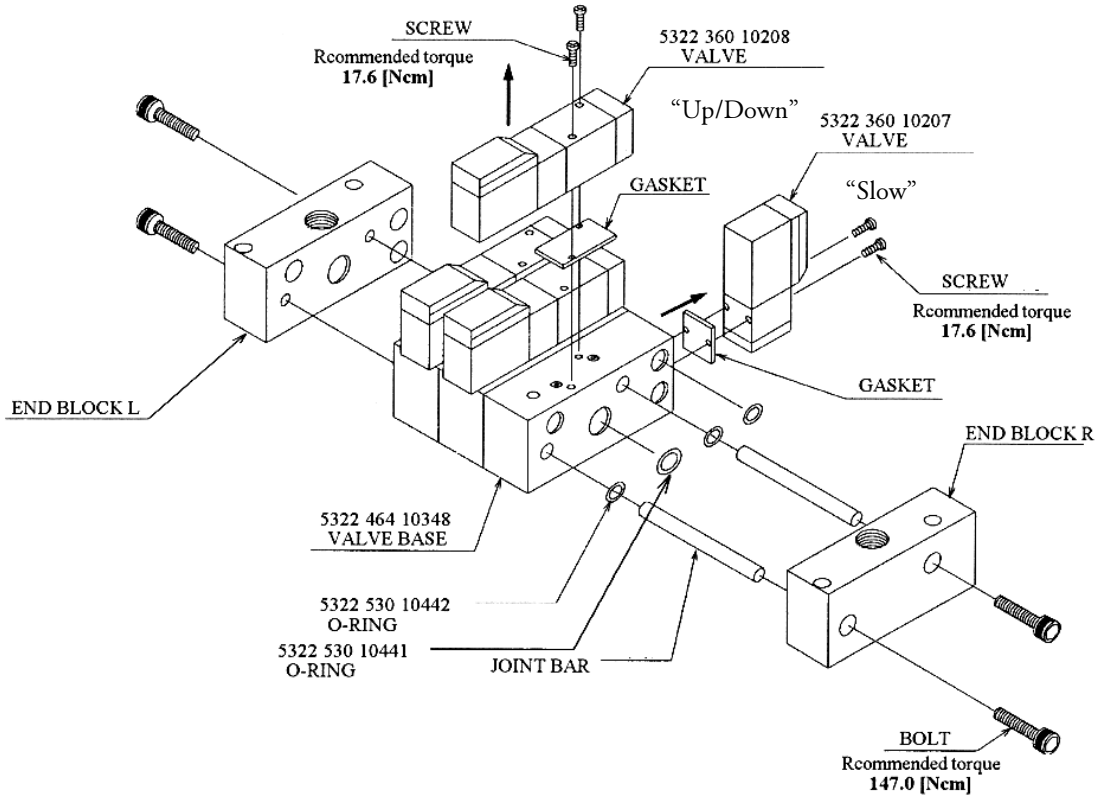


Figure 5-5 Head valves

REMARK: If there is a need to replace the end-blocks separate code numbers are available in the spare parts list.

CAUTION

1. Disconnect the power and air supply prior to replacing the valves.
2. Confirm the torque of each removed bolt prior to reconnecting air and power.

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CHAPTER 6 PCB Transport Systems

6.1. Introduction

This chapter describes the PCB transport system. The PCB transport system transports the PCB into the mounting area and secures it onto the mounting position. The PCB transport system, shown in figure 6-1 below, consists of:

The conveyor belt to transport the PCB to the mount position.
The main stopper to stop the PCB at the mounting position.
The push-in to set the PCB at mount position.
The locate pins (2) to fix the PCB by means of holes in the PCB.
The edge clamp cylinders (2) to fix the PCB whenever the locate pins cannot be used.
The push-up plate with push-up pins to support the PCB during mounting.
Sensors to detect the PCB at different positions on the transport system.

The PCB flow direction of european systems is most common from left to right, in asian countries the right to left PCB flow is most common.

For the electrical connections of these items we refer to the overall interconnection diagram in chapter 14 of this manual. The mechanical items and the dismantling of those items are explained in the next chapters. Each item of the transport system is arranged along the conveyor rails as shown in figure 6-1 below. The air solenoid valve of each item is located inside the lower right panel on the rear-side of the machine.

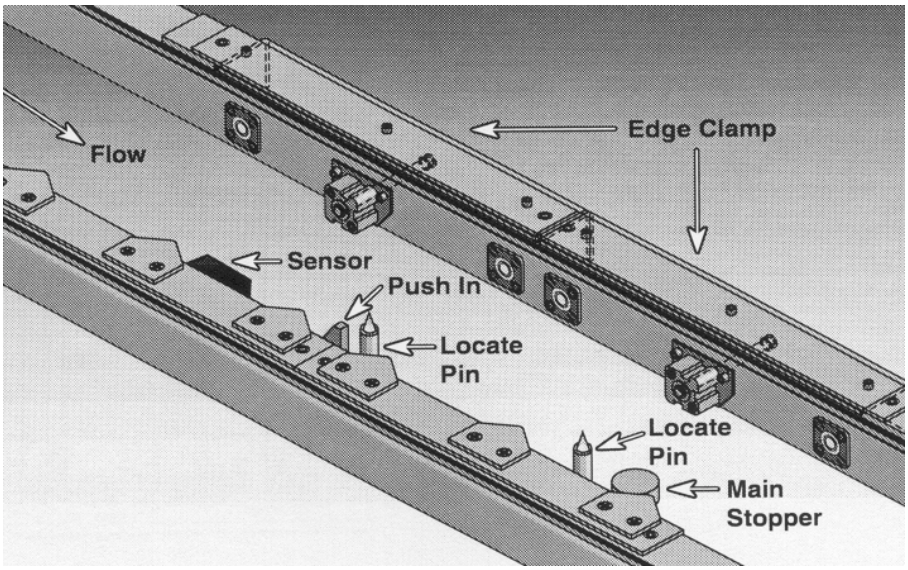

Figure 6-1 PCB transport system (top view)

6.2. Conveyor Belt

The conveyor belt transports the PCB's by belt in (for mounting) and out (when remounted) the Topaz. On a standard machine, PCB's are conveyed in the left-to-right direction while the conveyor width is adjusted by sliding the rear rail (the front rail is fixed). These specifications cannot be changed after the machine has been shipped.

6.2.1. Adjusting the Conveyor Belt Tension

If the conveyor belts are too loose, they may slip on the pulleys causing unstable transfer. If the belts are too tight, they may break or wear excessively. Both the tension of each belt on the fixed and movable rails should be adjusted evenly. If necessary, adjust the tension as follows (refer to figure 6-2):

1) Press the emergency stop button.

2) Loosen the tension adjusting bolt. The tension adjusting bolt is located on the right side of the conveyor rails and is linked to the idler. Use a hex wrench to loosen the bolt (but do not remove it).

3) Adjust the belt tension by sliding the tension adjusting bolt towards the outer side of the machine to increase the tension or towards the inner side to reduce the tension.

4) Re-tighten the tension adjusting bolt.

5) Check the tension by hand, then run the conveyor belt in manual mode as described in the operator manual and check that the motor pulley does not slip.

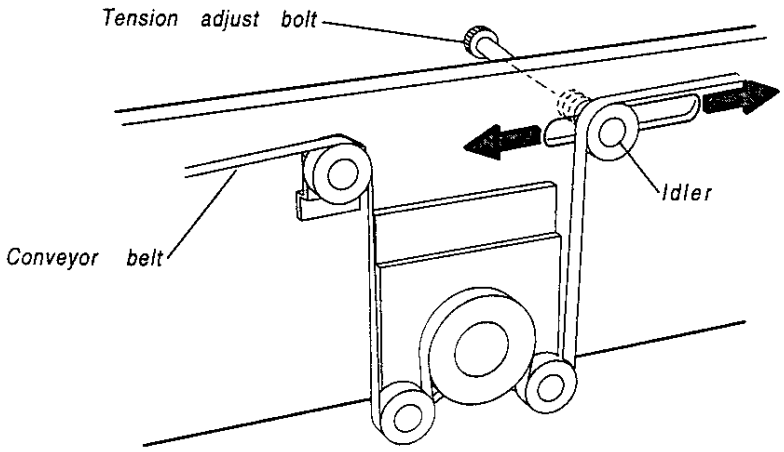

Figure 6-2 Adjusting the conveyor belt tension

6.2.2. Adjusting the Carry-In Conveyor Speed

The conveyor speed varies according to the frequency of the power supply and the weight of the PCBs on the conveyor. You can adjust the carry-in conveyor speeds by using the two adjusting screws located inside the lower right panel on the front side.

The carry-in conveyor moves at two speeds: a high speed (H) for reducing the transfer time of PCBs and a low speed (L) for minimizing impact when the PCB hits the entrance or main-stopper. To adjust these speeds, prepare typical PCBs and use the procedure below.

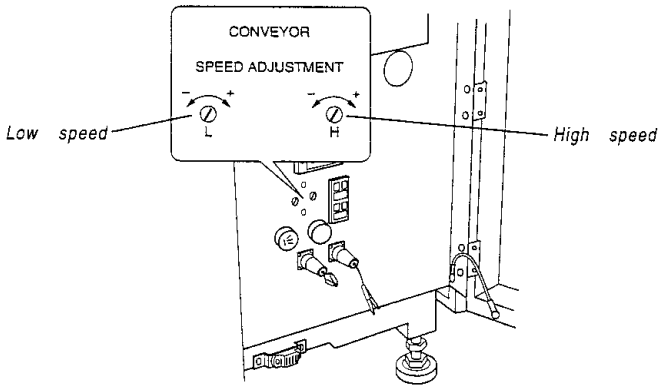

Figure 6-3
Carry-in conveyor speed adjusting screws

1) Adjust the conveyor width according to the size of the PCB. To adjust the conveyor width, the Conveyor Unit utility in the Data Manager will be convenient. (If your machine is not equipped with an auto conveyor width adjusting function, adjust manually.)

2) Open the output monitor screen and turn on the conveyor (see figure 6-4) Select <<3/MAINTE/M>>>/<<4/MANUAL>>/<C/DISPLAY &EXIT> /{C1/OUTPUT MONITOR} and press the [ENTER] key.
   - Use the arrow keys to line up the cursor with "TN13" (CONVEYOR ON).
   - Press the [ENTER] key to turn on the conveyor. The output monitor digit reads "1" if the conveyor is on, and "0" if it is off.

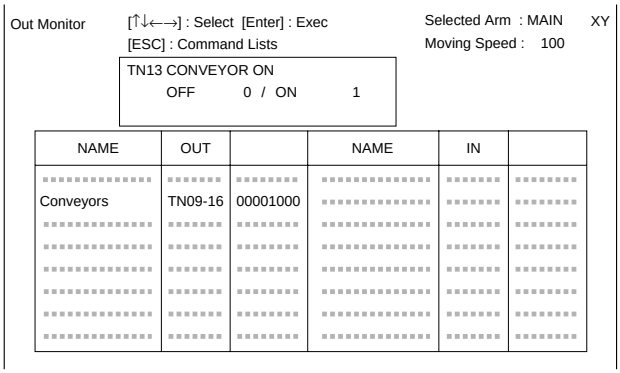

Figure 6-4 Output monitor screen, activate conveyor

3) While running the conveyor, switch the speed as follows (figure 6-5).
   - Use the arrow keys to line up the cursor with "TN14" (CONVEYOR SPEED LOW).
   - Press the [ENTER] key to switch the conveyor speed. The output monitor digit reads "1" when the conveyor is at low speed, and reads "0" when it is at high speed.

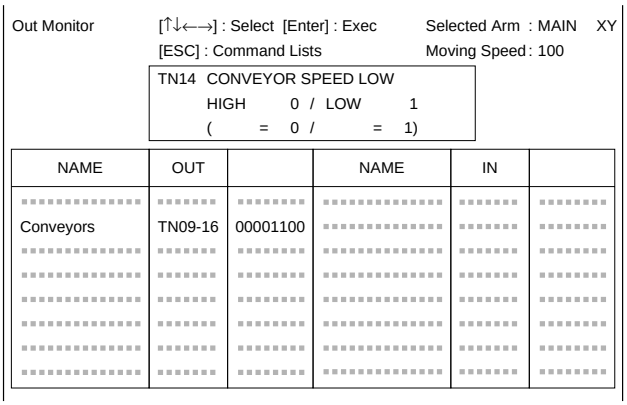

Figure 6-5 Output monitor screen, conveyor speed

4) Adjust the high speed while running the conveyor at high speed, adjust The speed by turning the "H" screw. Do not set the speed too high, as this may hamper switching response. Position the "H" screw at a point slightly slower than the maximum speed.

5) Raise the entrance stopper by selecting <<<3/MAINTE/M>>>/ <<4/MANUAL>>/ <C/DISPLAY&EXIT>/{C1/OUTPUT MONITOR} and press the [ENTER] key.
   Use the arrow keys to line up the cursor with "TN06" (STOPPER OF ENTRANCE).
   Press the [ENTER] key to raise the entrance stopper. The output monitor digit reads "1" when the entrance stopper is at the raised position, and reads "0" when it is at the lowered position.

6) Adjust the low speed while running the conveyor at low speed and carrying in a PCB, adjust the speed by turning the "L" screw. Position the "L" screw so that PCBs are not subjected to a strong impact when they hit the entrance stopper.

7) Check for switching from high to low speed while carrying in a PCB, check that the conveyor speed smoothly changes from high to low speed.

6.3. Main Stopper

When the conveyor belt transports a PCB into the Topaz the main stopper will stop the PCB at the mounting position. The ascent/descent speeds of the main stopper and the PCB contact point can be adjusted, please refer to figure 6-6 below.

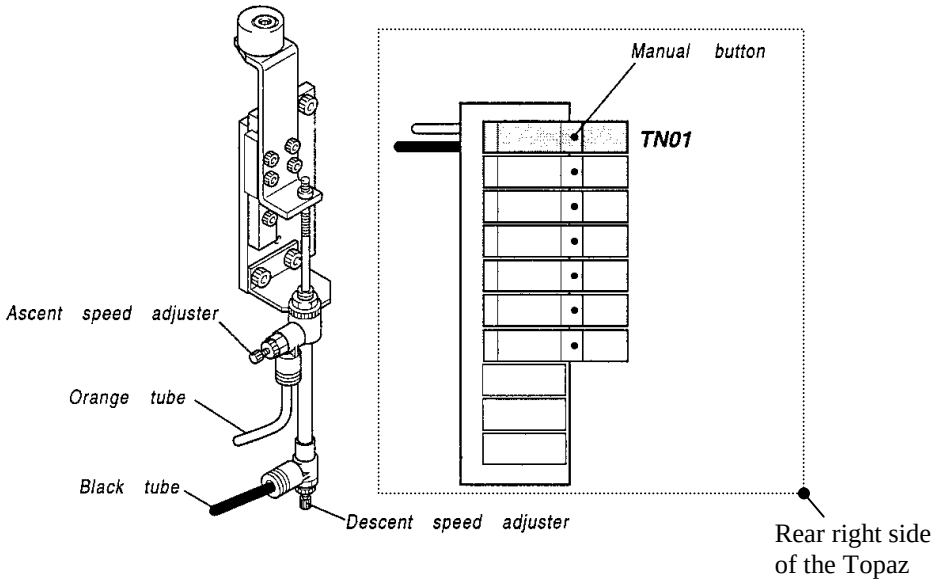

Figure 6-6 Main stopper and air solenoid valve

6.3.1. Adjusting the Ascent/Descent Speeds of the Main Stopper

1) Open the output monitor screen and operate the mainstopper (fig. 6-7)
   - Select <<<3/MAINTE/M>>>/<<4/MANUAL>>/<C/DISPLAY &EXIT> {C1/OUTPUT MONITOR} and press the [ENTER] key.
   - Use the arrow keys to set the cursor at "TN01" (MAIN STOPPER).
   - Press the [ENTER] key to alternately raise and lower the main stopper. The output monitor digit reads "1" when the main stopper is the raised position, and reads "0" when it is at the lowered position

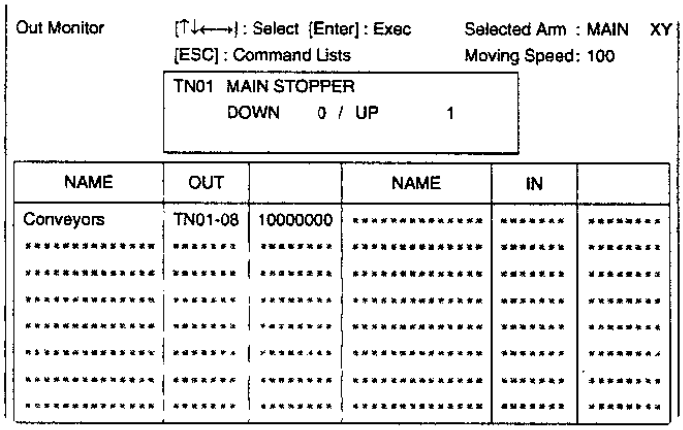

Figure 6-7 Output monitor screen, activate main stopper

2) Check the ascent and descent speeds. Both speeds should be around one second (at this speed the components which are pre-mounted on the PCB will not shift).

3) Press the emergency stop button, then adjust the ascent/descent speeds. Turning the speed adjuster knob for the orange tube adjusts the ascent speed, while turning the speed adjuster knob for the black tube adjusts the descent speed.

If the main stopper does not work normally in Step 1, manually check the operation without using the output monitor, as follows:

Press the emergency stop button.
Press the manual button of the air solenoid valve (marked "TN01") with a narrow screwdriver or similar tool having a pointed tip, to raise the main stopper.

If this method works, there will probably be a problem with the electric circuit for the air solenoid valve. Check the following points.

Electromagnetic coil breakage
Loose harness connectors
Trouble with the DC24V supply
I/O board output errors, etc

If pressing the manual button does not allow normal operation, there is a problem with the air supply, air piping or valves (damage, clogging and adhesion of foreign matter). Check the air supply line of the main stopper.

For any replacements on the main stopper please refer to figure 6-8.

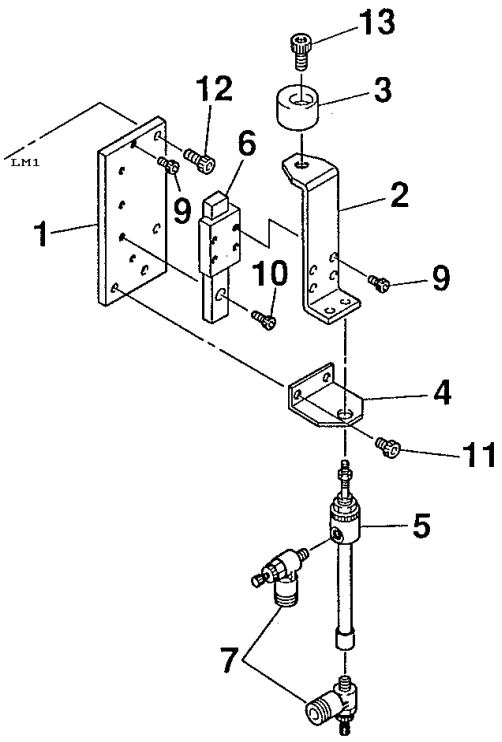

Figure 6-8 Main stopper exploded view

6.3.2. PCB Contact Point

The stopper of the main stopper is a steel "washer" with an out-centred fixation hole enabling the PCB contact point to be adjusted. If the positioning hole of the PCBs used has an offset to the typical position, you can adjust the orientation of the stopper in such a way that the locate pin can be exactly aligned with the PCB positioning hole, following steps indicate how, please refer to figure 6-9 below.

1) Adjust the conveyor width according to the size of the PCB. To adjust the conveyor width, the conveyor unit utility in the data manager will be very convenient (If your machine is not equipped with an auto conveyor width adjusting function, adjust manually).

2) Raise the main stopper by using the {B7/Conveyor Unit} utility or the output-monitor in the Manual mode.

3) Press the emergency stop button, set the PCB in the mounting position. Place the PCB against the main stopper, and determine the offset between the PCB positioning hole and the fixed locate pin.

4) Loosen the bolt securing the stopper by using the hex wrench, loosen the bolt but do not remove it to allow turning of the stopper.

5) Adjust the orientation of the stopper by slightly rotating the stopper so that the locate-pin can exactly be aligned with the PCB positioning hole.

6) Re-tighten the bolt to secure the stopper.

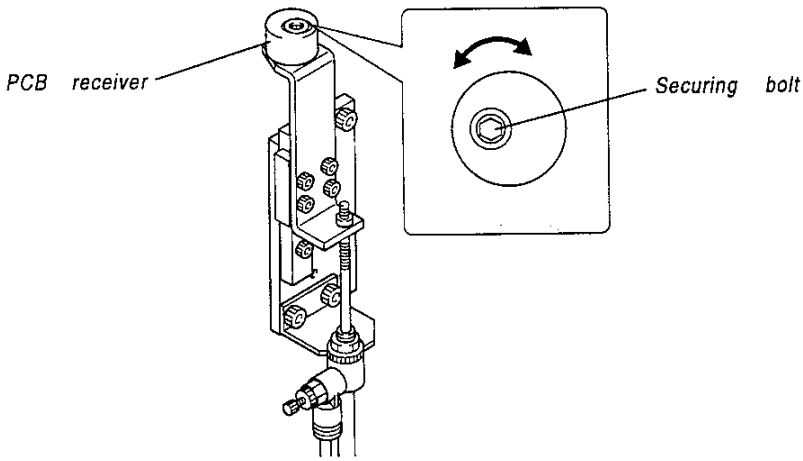

Figure 6-9 Adjusting the PCB contact point

CAUTION

When you use PCBs having typical positioning holes, you must return the above adjustment to the original setting.

6.4. Push-In

The push-in mechanism presses the PCB against the main stopper, securing it in the position for mounting. To adjust the speeds of the push-in mechanism, proceed as follows, refer to figure 6-10:

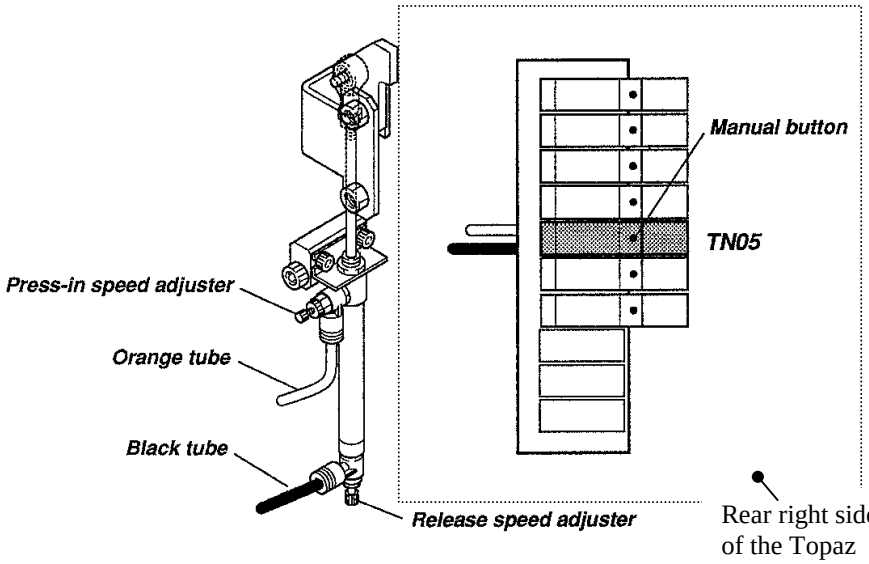

Figure 6-10 Push in and air solenoid valve

1) Open the output monitor screen (see figure 6-11) and operate the push-in mechanism.
   Select <<3/MAINTE/M>>>/<<4/MANUAL>>/<C/DISPLAY &EXIT>/{C1/OUTPUT MONITOR} and press the [ENTER] key.
   Use the arrow keys to line up the cursor with "TN05" (PUSH IN). Press the [ENTER] key to alternately close and release the push-in mechanism. The output monitor digit reads "1" when the push-in mechanism is active, and reads "0" when it is released.

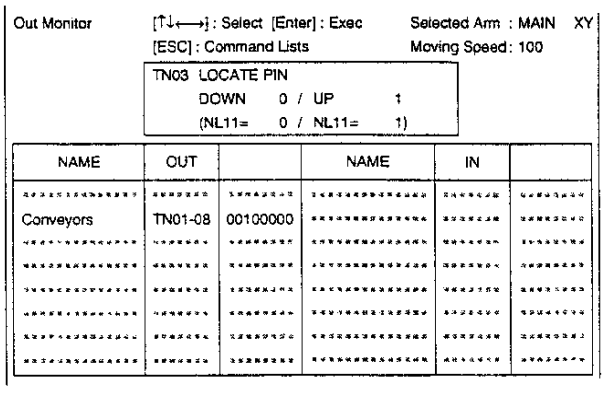

Figure 6-11 Ouput monitor screen, activate push in

2) Check the press-in- and release-speeds. Both speeds should be around one second (the speed at which pre-mounted components on the PCB will not shift).

3) Press the emergency stop button, then adjust the press-in/release speeds. Turning the speed adjuster knob for orange tube adjusts the press-in speed, and turning the speed adjuster knob for black tube adjusts the release speed.

If the push-in mechanism does not work normally in Step 1, manually check the operation without using the output monitor, proceed as follows:

Press the emergency stop button.

Press the manual button of the air solenoid valve (marked "TN02") with a narrow screwdriver or similar tool having a pointed tip, to make the push-in mechanism active.

If this method works, there will probably be a problem with the electric circuit for the air solenoid valve. Check the following points.

Electromagnetic coil breakage
Loose harness connectors
Trouble with the DC24V supply
I/O board output errors, etc.

If pressing the manual button does not allow normal operation, there is another problem with the air supply, air piping and pipette valves (damage, clogging and adhesion of foreign matter). Check the air supply line of the push-in mechanism. For any replacements of the push in assembly please refer to the figure 6-12.

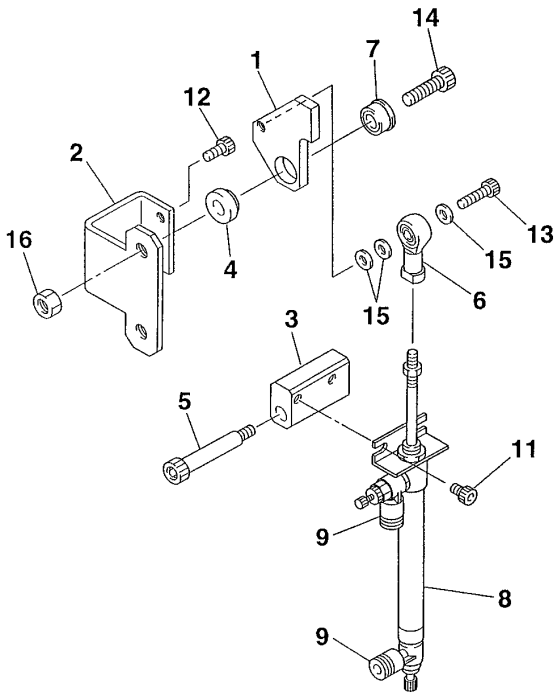

Figure 6-12 Exploded view Push-in

6.5. Locate Pin

Two locate pins are available along the conveyor rail: one fixed and one movable. These pins engage with the positioning holes of the PCB to secure it in place ready for mounting. To adjust the ascent/descent speeds of the locate pins, proceed as follows, please refer to figure 6-13 and 6-14.

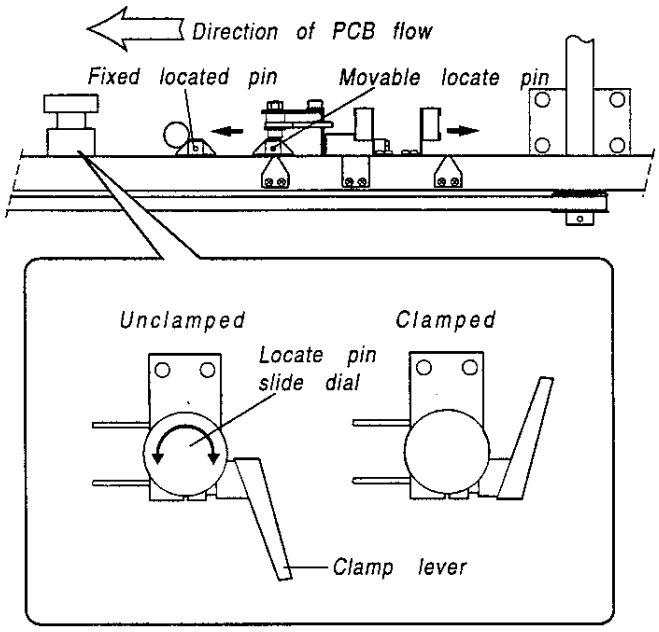

Figure 6-13 Locate pin arrangement

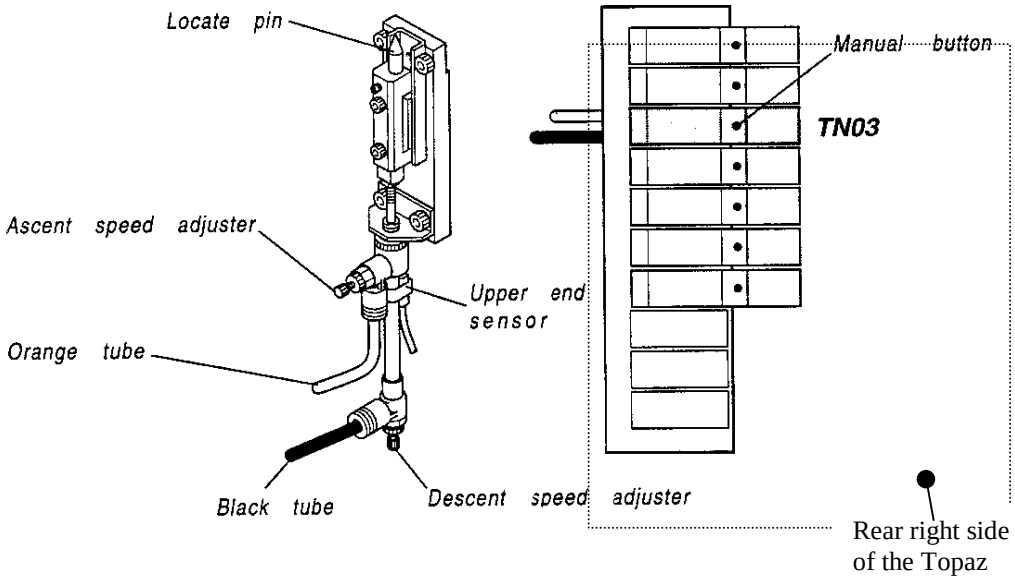

Figure 6-14 Locate pin and air solenoid valve

1) Open the output monitor screen (figure 6-12) and operate the locate pins. Select
<<3/MAINTE/M>>>/<<4/MANUAL>>/<C/DISPLAY&EXIT>
/{C1/OUTPUT MONITOR} and press the [ENTER] key.
Use the arrow keys to line up the cursor with "TN03" (LOCATE PIN).
Press the [ENTER] key to alternately raise and lower the locate pins. The output monitor digit reads "1" when the locate pins are at the raised position, and reads "0" when they are at the lowered position.

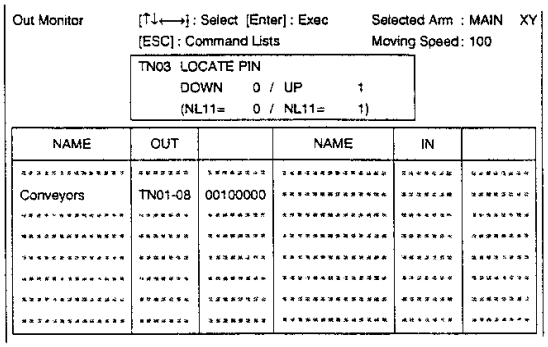

Figure 6-15 Output monitor, activate locate pins

2) Check the ascent and descent speeds. Both speeds should be around one second (the speed at which pre-mounted components on the PCB do not shift).

3) Press the emergency stop button, then adjust the ascent/descent speeds. Turning the speed adjuster knob for the orange tube adjusts the ascent speed, and turning the speed adjuster knob for the black tube adjusts the descent speed.

4) Check the input status from the upper limit sensor. Pressing the [TAB] key allows the cursor jump to "NL11" on the right-hand input monitor screen. When the upper limit sensor is properly attached, the input monitor digit for "NL11" reads as follows:
"1" when the locate pins are at the raised position.
"0" when the locates pins are at the lowered position.

If the locate pins do not work normally in Step 1, manually check the operation without using the output monitor, as follows:
Press the emergency stop button.
Press the manual button of the air solenoid valve (marked "TN03") with a narrow screwdriver or similar tool having a pointed tip, to raise the locate pins.

If this method works, there will probably be a problem with the electric circuit for the air solenoid valve. Check the following points.

Electromagnetic coil breakage
Loose harness connectors
Trouble with the DC24V supply
I/O board output errors, etc.

If pressing the manual button does not allow normal operation, there is a problem with the air supply, air piping or pipette valves (damage, clogging and adhesion of foreign matter). Check the air supply line of the locate pins. For any replacement of the locate pin please refer to figure. 6-16.

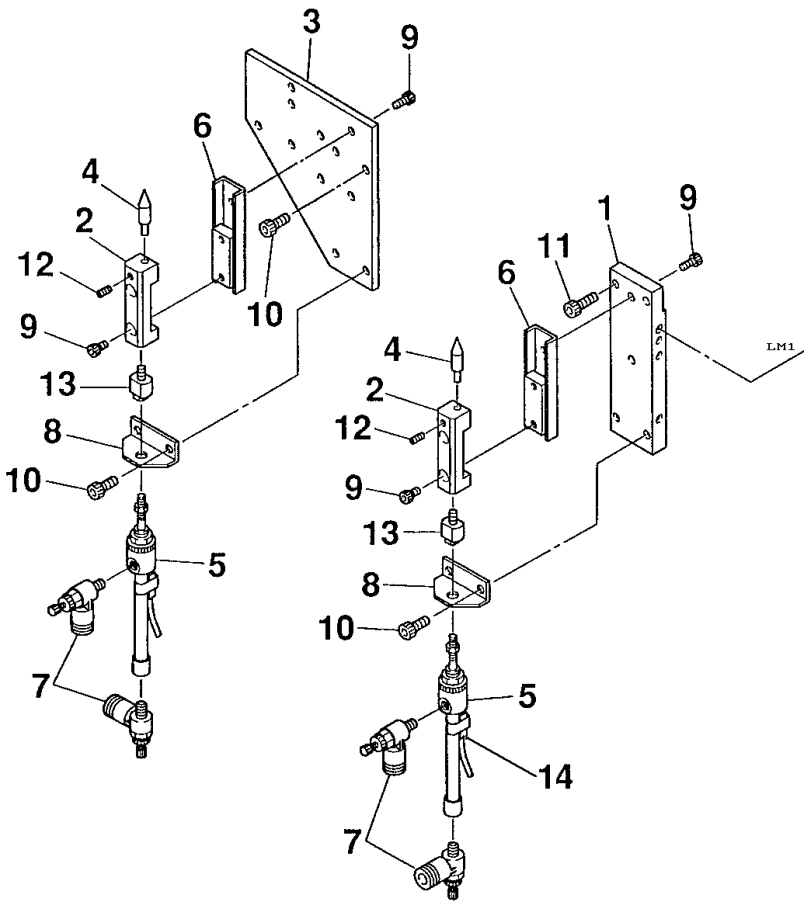

Figure 6-16 Exploded view Locate pin assembly

6.6. Edge Clamp

Another PCB clamping method is the use of the edge clamp cylinders, whenever the locate pins cannot be used the edge clamp cylinders can be used to press the PCB against the front conveyor rail and so fix it to the mounting position.

The edge clamp cylinders do not have any adjustment possibilities. Of course the edge clamps can be activated by means of the output monitor TN04, please refer to figure 6-17.

For the any replacements of the edge clamp assembly please refer to the figure 6-18.

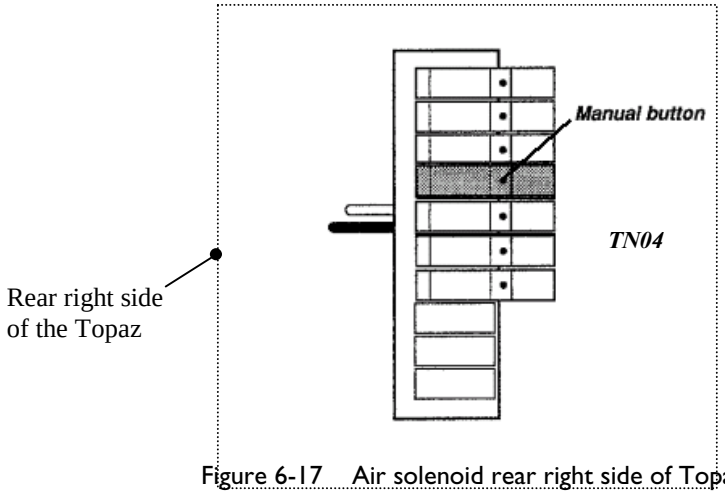

Figure 6-17 Air solenoid rear right side of Topaz

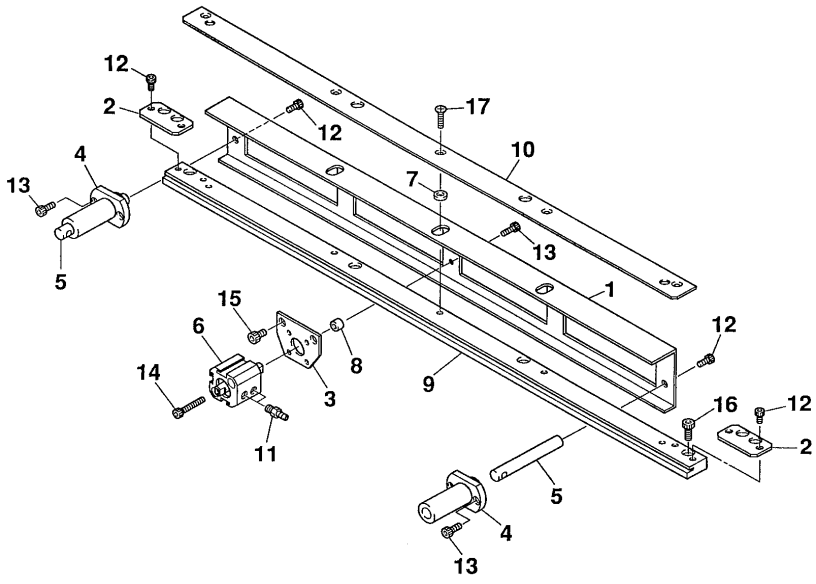

Figure 6-18 Exploded view edge clamp assembly

6.7. Push-Up

The push-up plate is located directly underneath the component mounting position. The support pins, attached by magnets on the surface of the push-up plate, support the PCB during the mounting process. The PCB will be pushed against the top side of the conveyor rail, please refer to figure 6-19. To adjust the ascent/ descent speeds of the push-up plate, proceed as follows;

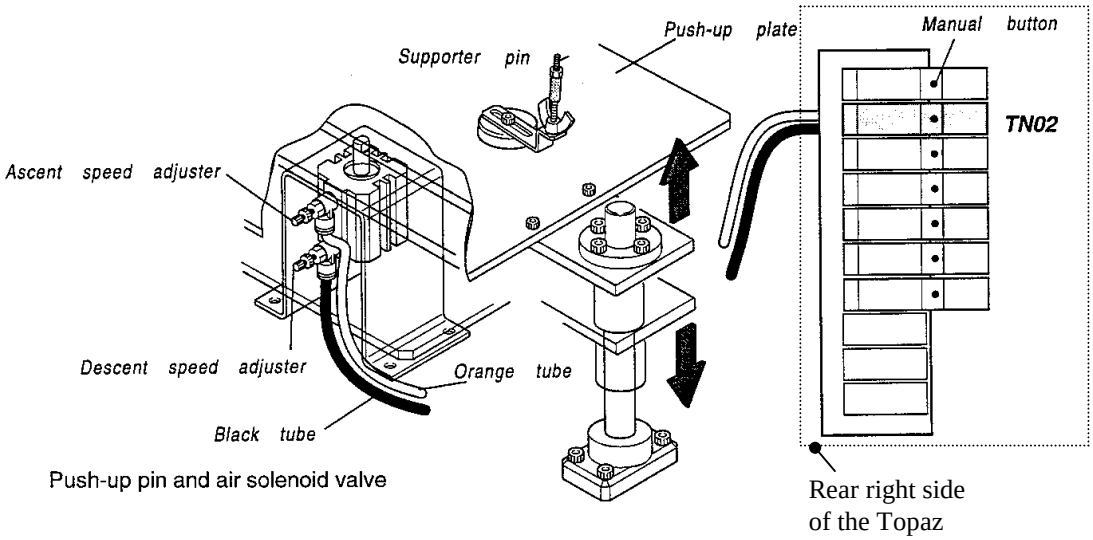

Figure 6-19 Push-up and air solenoid valve

1) Open the output monitor screen and operate the push-up plate.
   1.Select <<<3/MAINTE/M>>>/<<4/MANUAL>>/<C /DISPLAY &EXIT>{C1/OUTPUT MONITOR} and press the [ENTER] key. Use the arrow keys to line up the cursor with "TN02" (PUSH UP). Press the [ENTER] key to alternately raise and lower the push-up plate. The output monitor digit reads "1" when the push-up plate is at the raised position, and reads "0" when it is at the lowered position.

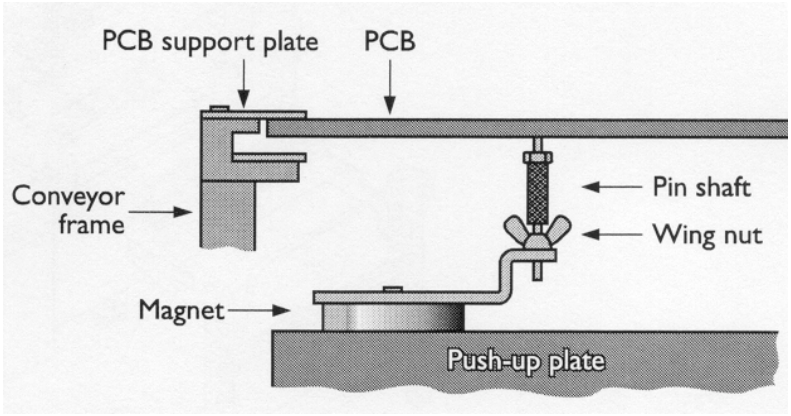

Figure 6-19a PCB supporter pins

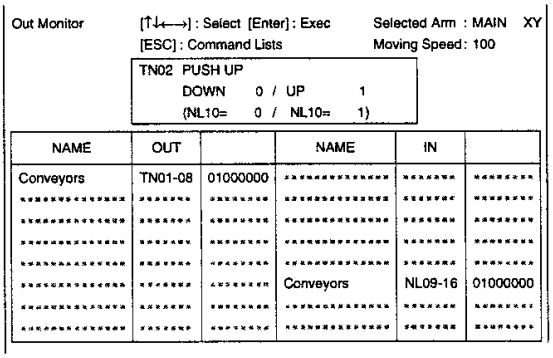

Figure 6-20 Output monitor, activate push-up

2) Check the ascent and descent speeds. Both speeds should be around one second (the speed at which components pre-mounted on the PCB will not shift).

3) Press the emergency stop button, then adjust the ascent/descent speeds. Turning the speed adjuster knob for orange tube adjusts the ascent speed, and turning the speed adjuster knob for black tube adjusts the descent speed.

4) Check the input status from the upper limit sensor. Pressing the [TAB] key allows the cursor jump to "NL10" on the right hand input monitor screen. When the upper limit sensor is properly attached, the input monitor digit for "NL10" reads as follows:
"1" when the push-up plate is at the raised position.
"0" when the push-up plate is at the lowered position.

If the push-up plate does not move normally in Step 1, manually check the operation without using the output monitor, as follows:
Press the emergency stop button.
Press the manual button of the air solenoid valve (marked "TN02") with a narrow screwdriver or similar tool having a pointed tip, to raise the push-up plate.
If this method works, there will probably be a problem with the electric circuit for the air solenoid valve. Check the following points.
Electromagnetic coil breakage
Loose harness connectors
Trouble with the DC24V supply
I/O board output errors, etc.

CAUTION

When you set the push-up pins on the push-up plate, make sure that the push-up pins do not interfere with the conveyor rails and edge clamp cylinder.

If pressing the manual button does not allow for normal operation, there is another problem with the air supply, air piping and pipette valves (damage, clogging and adhesion of foreign matter). Check the air supply line of the push-up plate. For any replacements on the push up assy refer chapter 13.

6.8. PCB Detection Sensors

In the conveyor assy there are five PCB detection sensors arranged along the front rail of the conveyor. The sensors each have LEDs mounted on the side, which are normally lit. When the sensor detects the presence of a PCB, the LED turns off, please refer to figure 6-21.

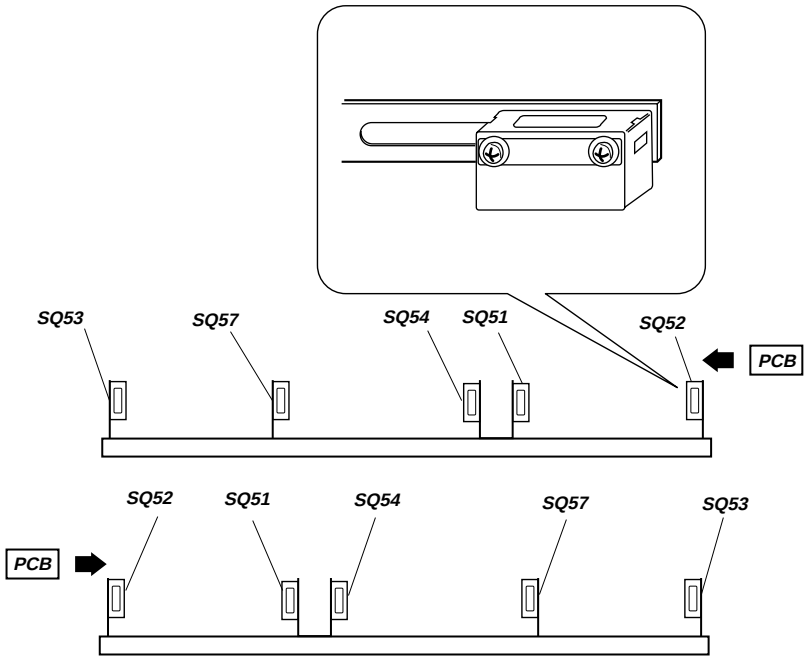

Figure 6-21 PCB detection sensors

The table 6.8-1 below shows the PCB detection sensors, their function and their location. The sensor code can be used to track the sensors in the diagrams of chapter 14. The sign is the software code which is used for instance in the DI/DO screen of the software.

Sensor	Location	Sign	Remarks
SQ51	Entrance stopper 1	NL01	Stopper for decelerating transport.
SQ52	Conveyor entrance	NL02	-
SQ53	Conveyor exit	NL04	-
SQ54	Entrance stopper 2	NL03	PCB detection.
SQ57	PCB securing position	NL09	-

Table 6.8-1

The sensors may not detect a PCB (see figure 6-22) due to such factors as the orientation, distance and angle at which it is attached. The sensors may also be affected by strong extraneous light, excessive dust, and the shape (hole or notch) and color of the PCB. Using PCBs on which you actually mount components, check that the sensors can detect them reliably.

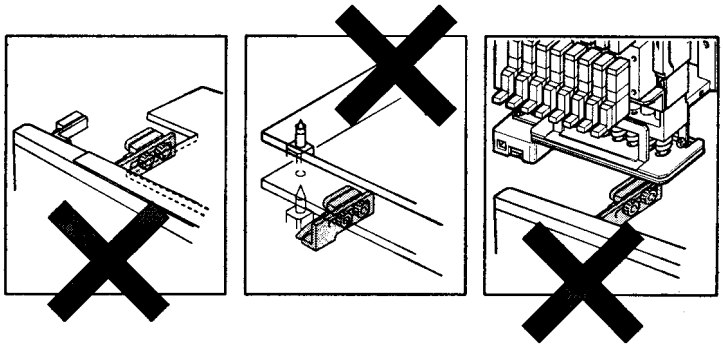

Figure 6-22 PCB sensors detection errors

1) Prepare the PCB you will actually use for component mounting.

2) Adjust the conveyor width according to the size of the PCB.
To adjust the conveyor width, you can use the Conveyor Unit utility in the. Data Manager. (If your machine is not equipped with an auto conveyor width adj. function, adjust manually.)

3) Press the emergency stop button and pace the PCB on the conveyor.

4) Open the input monitor and check the detection status, figure 6-23.
Select<<<3/MAINTE/M>>>/<<4/MANUAL>>/<C/DISPLAY&EXIT >/{C2/INPUT MONITOR} and press the [ENTER] key.
Use the arrow keys to line up the cursor with "TN01" to "TN09".
The input monitor digit reads "1" when the PCB is detected, and reads "0" when not detected. Check that the digit of each sensor reads "1".
Also check that the detection status of the sensor SQ57 (NL09) does not vary even if the locate pins and push-up plate are raised.

In Monitor [↑↓←→] : Select [Enter] : Exec Selected Arm : MAIN XY
[ESC] : Command Lists Moving Speed : 100

NL09 SET POSITION
DETECT 1

NAME	OUT		NAME	IN	
			Conveyor	NL09-16	10000000

Figure 6-23 Input monitor

5) Place a PCB over each sensor along the conveyor and check if the are

OK. To secure the PCB in the mounting position over the sensor SQ57, the Conveyor Unit utility will be convenient

6) If necessary, adjust the position of the PCB detection sensor. Loosen the screws securing the sensor, and adjust the position, orientation or angle at which it is attached.

7) Remove the PCB from the conveyor.

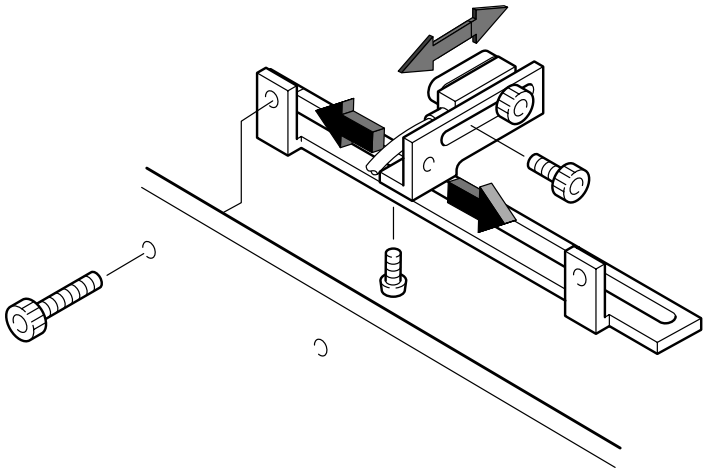

Figure 6-24 Adjusting the position of the PCB detection sensor

6.9. Conveyor Errors

The table 6.9-1 shows some possible conveyor problem symptoms that may occur.

Symtom	Possible causes	Corrective action
The PCB hits hard against the main stopper.	The soft stop function is defect or adjusted incorrectly.	Open the front lower right panel of the machine, you will see the two adjustment scres for the conveyor speed, adjust the L-screw to the left slightly to reduce the conveyor speed.
The PCB does not reach the main stopper at all.	The soft stop function takes too much effect.	Open the front lower right panel of the machine, you will see the two adjustment scres for the conveyor speed, adjust the L-screw to the right slightly to increase the conveyor speed.
A PCB transfer error (PCB installation error) occurs when a thick PCB is conveyed.	The locate pin will not rise adequately for a thick PCB or a PCB having a small reference hole, so the sensor remians off.	Loosen the screw for the locate pin sensor and slightly lower its position. Then check that the sensor turns on when the PCB is secured in place.
After the PCB has been conveyed in the mounting position the pins will not rise to secure the PCB (the conveyor keeps turning).	The sensor at the PCB installation position is faulty, or the PCB has a cutpout area just above the sensor so the sensor cannot detect the PCB.	Check the sensor operation in the manual mode (input monitor). If the sensor is defect, replace it. If the sensitivity is too low adjust the height of the sensor.

Table 6.9-1 Possible conveyor problem symptoms

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CHAPTER 7 Component Transport Systems

7.1. Introduction

This chapter describes the component transport system that is responsible for feeding and/or transporting components.

7.2. Head Assembly

The head assembly (figure 7-1) of the TOPAZ consists of eight in line heads. This chapter describes how to check, adjust and optimize air-driven mechanical movements, vacuum generation and machine data related to the head assembly, see the table below.

Head descent movement	Check that each head descends smoothly
Head lower end detection	Check that the lower end is correctly detected when each head descends.
Vacuum generation	Check that the vacuum ejector provides adequate vacuum levels.
Vacuum sensor function	Check that the vacuum sensor display levels are correct.
Machine coordinates (position)	These coordinates include the stand-by point for the head and discard point for components
Pick and mount vacuum levels	The reference vacuum pressure (suction) is used to determine whether each head has picked up or mounted a component.
R-axis absolute accuracy offset*	Angular offset for the R-axis that rotates each nozzle shaft.
Nozzle correction*	This is used to correct an off-center nozzle shaft when it rotates by 180 degrees.
Head offset*	The position of the heads related to fiducial camera

* These parameters are automatically corrected when you perform mount feedback described later in chapter 11 “Machine Installation and Calibration”.

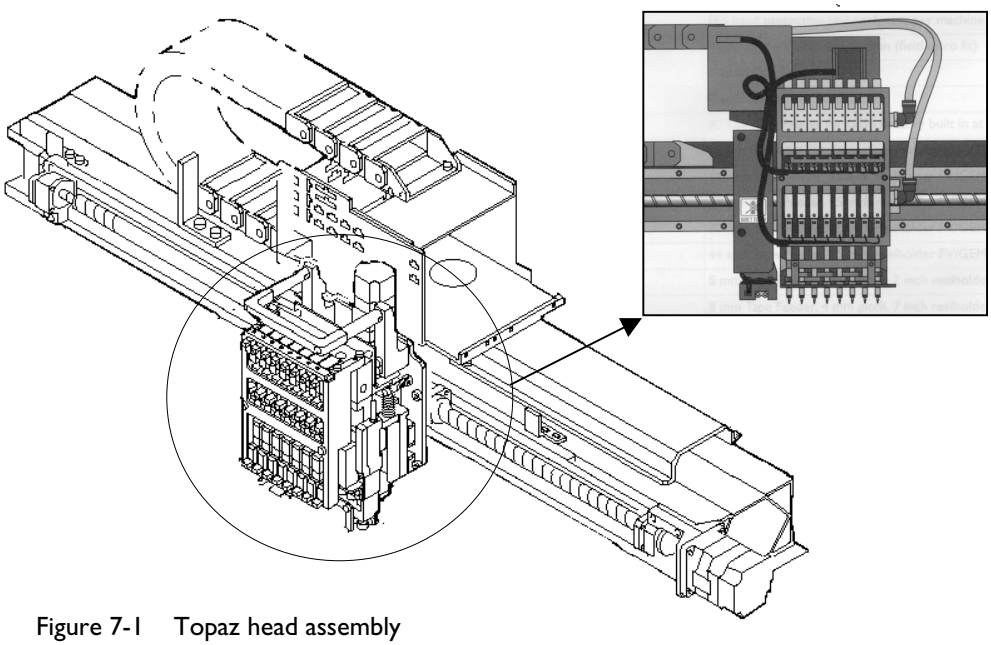


Figure 7-1 Topaz head assembly

7.2.1. Mechanical Check Head Assembly

This chapter describes how to check the air driven mechanical movements and vacuum generation in the head assembly.

Checking the ascent/descent movement

First make sure to the head is in such a position that it cannot hit anything when lowered. Lower the head as follows :

- Open the output monitor with <3/4/C1 output monitor> and select the target head TE01 to TE08 with the cursor.
- Press the enter key to lower the target head, the output monitor position reads “1” when lowered and “0” when the head is raised.

Checking the lower end detection sensor

- While the head is lowered move the cursor with the TAB key to the input screen and move the cursor to the head up/down sensor input NG01 to NG08.
- Check the status of the input.
- When the head is lowered (output =”1”) the input monitor should read “1”. The opposite situation is valid when the head is raised.

Note1:

The head end-lower sensor that are used are of the type “normally closed” For safety reasons. When a sensor wire breaks the machine will detect a head in the lower position and will stop immediately.

Note2:

If the head does not move normally during the above testing, check the operation of the head manually as follows;

- Press the emergency button.
- Press the manual button (red button on top of the air valve) of the air valve that is the most close to the nozzles by means of a narrow screw driver.

When the head lowers in this situation the circuitry that should operate the valve is defect. Points to check are following;

- Damaged valve
- Loose harness connectors,
- DC24V power supply
- I/O-board etc.

When performing manual operation does not move the head down there is a problem with the pneumatic installation. Check following;

- Air supply
- Air filters
- Air piping
- Air valves

Checking the vacuum generation

This chapter explains how to check the vacuum generation of Heads 1 to 8. You can also find whether maintenance (cleaning or replacement) is required by measuring the vacuum intensity of the vacuum ejector.

Measuring the vacuum generation of the desired head:
Press the emergency stop button.

1. Open the output monitor screen and select the target head.
   - Select <3/4/C1 OUTPUT MONITOR> and press the [ENTER] - Use the arrow key to line up the cursor with "TH01" (HEAD1 VACUUM) or any other head. TH02 to TH08.

2. Press the [ENTER] key to generate the vacuum in the selected head. The output monitor digit changes to “1’ when the vacuum ejector is on.

3. Check the vacuum generation
   Check that the pickup vacuum is generated, by placing your finger over the nozzle tip opening of the target head and feeling the suction

   If the vacuum generation does not work normally, check the operation without using the output monitor, as described below:
   - Press the emergency stop button.
   - Press the manual button of the air valve, use a screwdriver or a similar tool.

   When this method works, the electric circuit for the air valve is probably defective. Check the following points; connector misconnection, electro-magnetic coil breakage, loose harness -connectors, trouble with the DC24V supply, I/O board output errors, etc.

   Whenever pressing the manual button does not allow normal operation, there is a problem with the air supply, air piping and pipette valves (damage, clogging and adhesion of foreign matter). Check the vacuum ejector air supply line.

   Check for air leakage (drop in vacuum) in each head by connecting a vacuum gauge with air tube to the type 32 nozzle. Measure the vacuum intensity (mmHg), the vacuum intensity is satisfactory when "-500 mmHg" or higher.

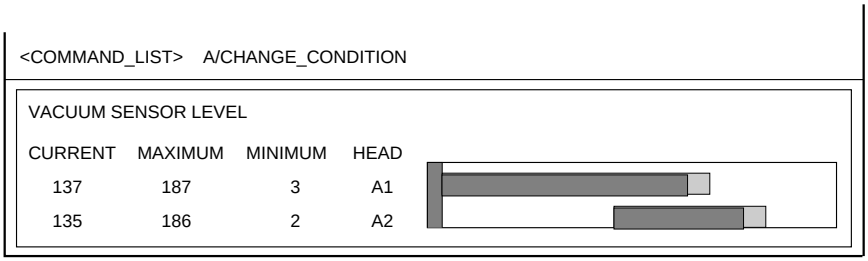
   If the vacuum intensity measured with the vacuum gauge is lower than "-500mmHg", the vacuum generation line (nozzle shaft, air hose, etc.) may be clogged. If no clogging is observed, the vacuum ejector causes the problem.

Checking the vacuum sensor function

To check the vacuum sensor function of the desired head by following procedure;

1. Press the emergency stop button.
2. Open the output monitor screen and select the target head.
   - Select <3/4/C1 OUTPUT MONITOR> and press the [ENTER] key.
   - Use the arrow key to line up the cursor with "TH01" (HEAD1 VACUUM) or any other head TH02 to TH08.
3. Press the [ENTER] key to generate the vacuum in the selected head. The output monitor digit changes to “1’ when the vacuum ejector is on.
4. Select <3/4/MANUAL>/<3A VACUUM SENSOR> and press the [ENTER] key.

The current vacuum levels of all heads are displayed on the operation monitor.



70443104-00

Figure 7-2 Vacuum level display

5. Check the vacuum sensor function.
   Make sure that the vacuum level (bar graph and numerical value on the) of the selected head changes when you place your finger over the nozzle tip opening and then remove it. The vacuum level increases when the nozzle tip opening is closed.
6. Return to output monitor screen and turn off the vacuum.
   Check that the cursor is on the target head in the Head Vacuum column on the output monitor and press the [ENTER] key to turn off the vacuum.

7.2.2. Machine Coordinates

When you select <<< 3/ MAINTE/M >>> /<< 3/ MCH_ADJUST >> / < B/ SAVE&QUIT > /{ B1/ ADJUST TARGET } /"Position" and press the [ENTER] key, the following display appears, showing the position of each part versus the origin and other basic parameter settings. This section describes how to set the most important parameters.

Editing — Object: Position

Object	Type	X	Y	Z	R	Feeder
FINE angle	0.03					
Multi camera	Intermit		900.00	0.00	0.00	
Locate pin		77.27	195.76		0.00	
Edge Clamp		77.27	195.76		0.00	
Wait point		344.29	430.84	0.00	0.00	
Discard point		115.14	76.45	0.00		50
PCB/Fix.TF				16.95	16.95	
Dual Rec Offset		0.76	0.00		-0.01	
Sumul.pickarea		0.20	0.20	0.20	1.00	
QFP clearance	4.00					
CngTimer/Speed		100.00	100.00			
Retry Limit.	14					
Dump stn.point	0.00	0.00	0.00	0.00		1
Dump stn. timer	0.00	0.00	0.00	0.00		1
Moving height				0.00		

Figure 7-3 Machine coordinates editing screen

A) Fine angle

When FINE mode is selected to recognize a QFP with the single-vision camera, the FINE angle parameter determines how accurately the recognition angle should be converged (adjusted) to the specified angle. This parameter can be 0.01, 0.02, 0.03 or 0.04 degrees. We recommend setting to the minimum value of 0.01 for adjustment, and to 0.02 or 0.03 for actual mounting operation (0.01 takes more time). Use the [INS], {DEL] or [SPACE] key to make a selection.

NOTE: The smaller the setting of this parameter, the higher the recognition angle accuracy. However, the recognition time will be longer affecting the cycle time, or there may be occasions when the component is dumped without being converged to the specified angle.

B) Multi camera

For the multi camera following parameters are foreseen:

- Multi camera “Y”
  This parameter reflects the speed in millimeters per second at which the head assembly travels over the multi-camera during component recognition. Set this parameter to “900”, this value is an optimum so do not change this value.
- Multi camera “Z” and “R”
  These settings are for correcting the angular shift of the multi-vision camera versus the mounter axis. The “Z”-column is for the optional multi-camera 2 while the “R”-column is used for the standard multi-camera 1. Please set this value to “0.00”.

C) Locate pin

This setting is the reference position when the PCB is secured in the mounting position on the conveyor. This position is also referred to as the PCB origin. When setting this locate pin position use following procedure:

- Open the positions screen by <3/2/A1 select target> “position” and press Enter.
- Line up the cursor with the “X” or “Y” value in the “locate pin row”.
- Press F10 and set the teaching conditions, select the camera as the teaching unit at a slow speed e.g. 20 and press enter again.
- Move the head above the fixed locate pin by means of the joystick. Align the cross cursor in center of the locate pin.
- Perform teaching of the locate pin by pressing the F10 key twice to enter the X coordinate, perform the same for the Y-coordinate.
- Save the settings by pressing ESC and select <B2 save data> or <B0 save&quit>.

D) Edge clamp

When the edge clamps are used to secure a PCB on the conveyor instead of using the locate pins the PCB position may shift slightly relative to the position determined by the pins. If a shift (in millimeters) is found subtract it from the locate pin coordinates and enter this coordinate in the edge clamp parameters. Normally the same parameters as the locate pins are entered in here.

E) Wait point

Pre-Condition: Origin the machine.

When the machine is idle (waiting for new PCBs), the heads will move to a Wait Position. This position can at any *ld* X/Y position, but take care of the following notes:

- Sensor positions (they might accidentally be activated).
- If the FES option is installed in the system, it is advised to teach the wait-position at such a location that the FES head protection sensor **is activated** when the wait-position is reached. This FES head protection sensor is used to release the FES (enabling a FES carriage exchange).

To select the position by means of the joystick do following:

- Select <3//4/A1 select axis> and press Enter.
- Select Main XY and press Enter.
- Move any desired head to the desired wait point.
- Select <3/3/B4 conditions of TCH> and press Enter.
- Select the desired head for teaching and press Enter.
- Select any speed and press Enter
- Select <3/3/B1 adjust target> “position”.
- Position the cursor on the X-column of the Iwait position and press F10 twice. Do the same for the Y-value.
- Save the settings by pressing ESC and selecting save data.

F) Discard point

This is the position at which the head discards a component. Typical discard point coordinates are entered prior to shipment

Since it is not necessary to lower the nozzle when discarding a component, the Z coordinate is usually set to 0.00. To change the discard point XY coordinates, use the same procedure as for setting the wait point. Make sure that the head assembly will not be detected by a PCB sensor. Verify that when a component is discarded the discarded component will not interfere with the PCB transport assy, camera or sensors.

The “Feeder column indicates the duration for which the air blow turns on to discard a component (in milliseconds). This value is set typically to 20 to 100msec.

G) PCB/Fix. TF

The Z coordinate represents the height of the head assembly positioned to mount components on a PCB. Set this parameter by teaching the height at which the nozzle of Head 1 just makes contact with the surface of a PCB which is secured in the mounting position. The R coordinate is the height of a pallet when a manual tray feeder (MTF) is used. To perform teaching for the PCB height (Z coordinate), follow the steps below. First prepare a PCB and check that a "Type 31" nozzle is attached to Head 1.

1) Press the emergency stop button and secure the PCB on the conveyor. Use the push-up pins so that the PCB surface is kept level. (It is not necessary to use the locate pins in this case.)
2) Move the head assembly by hand so that Head 1 is positioned above a location on the PCB.
3) Lower Head 1 first pneumatically and then by hand to the PCB surface.
4) Lower Head 1 until the nozzle tip just makes contact with the PCB surface.
5) Ensure safety and release the emergency stop.
6) Enter the MCH_ADJUST mode and set teaching conditions
   1. Select <3/3/B4 CONDITION OF TCH> and press the [ENTER] key.
   2. Select "Head 1" or "Head 2" as the teaching unit and press [ENTER].
   3. Select any speed from "Speed 1" to "Speed 5" and press the [ENTER] key
7) Select <3/3/B2 ADJUST TARGET> ’ "Position" and press the [ENTER] key
8) Press the [F10] key twice to perform teaching for the Z coordinate
9) Press the [ESC] key, then select <B2 SAVE DATA> or <B0 SAVE & QUIT> and press the [ENTER] key.

NOTE:

It is also possible to teach the height on the fixed conveyor rail surface, which is basically the same height as the PCB surface.

H) Dual recognition offset

This parameter is used to be able to go from left to right and the opposite way over the multi-cameras, this is set during adjusting of the cameras.

I) Simultaneous pickup area

This parameter is used to determine whether multiple heads can pickup components simultaneously. Each column respectively shows the allowable ranges of pickup positions XYRZ that permit simultaneous pickup from different component feeders. Typically XY and Z should be set to 0.2mm and the R to 1 degree.

J) QFP clearance

If a large impact is applied to a QFP at the instant when a head lowers to pick or mount it the leads of the QFP in questions are likely to bent. To avoid this the soft landing pickup or mounting is useful. This parameter specifies the Z-stroke to perform the soft landing and is typically set to 4mm. When "0.00" is entered the soft landing is not performed.

K) CngTimer/Speed

The value in the "X" column is the time duration for which a head stays at the lower end position when changing a nozzle. (Units are milliseconds.) A typical setting is around 200msec. If a nozzle change is unsuccessful, try entering a slightly larger value. A value of as long as one second (1000msec) can be set.
The value in the "Y" column is the relative ascent and descent speed for the head during nozzle change. This is normally set to 100%. If a nozzle change is unsuccessful, try decreasing this value slightly.

L) Retry limit

This is the maximum number of retries that the mounter is allowed to retry picking or recognizing after when an error occurs. This parameter can be any value from 1 to 14. Use the space, insert and delete key's to change the setting. When you do not want to allow retries set this parameter to NO RETRY. The number of retries can also be specified for each component to be mounted. In these cases the retry is performed a number of times up to a minimum setting.

M) Dump point

This parameter describes where a component that failed the recognition should be dumped.

N) Moving height

This parameter is invalid in the Topaz surface mounter and should be set to "0.00".

7.2.3. Pickup and Mount Vacuum Levels

Pre-Conditions: None

The vacuum pressure to pickup a component is analogue detected and digitally represented by a scale of 0 to 255. The current levels are shown in the following screen: <3/2 MCH_DATA>/A1 SELECT TARGET> "Vacuum level" and press Enter. See figure 7-4.

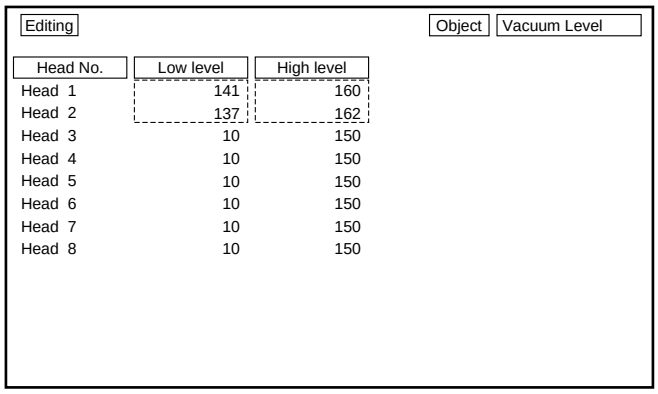


Figure 7-4 Current vacuum levels

Machine vacuum levels must be set for the following purposes:

1. If components are vacuum checked
2. The vacuum build-up time before the head can move up during a component pickup action.
3. The vacuum release time before the head can move up during a component mount action.
4. The vacuum levels that are defined are machine reference values and must cover the whole range of nozzle types and the whole range of components.

For all eight heads in the machine two levels are defined:

1. **Vacuum low Level:** This is the lowest possible level that can be reached for vacuum for any of the heads. A type 31 nozzle should be attached to all heads while measuring this vacuum level.
2. **Vacuum high Level:** This is the highest possible level that can be reached for vacuum for any of the heads. This should be determined with any nozzle attached to the head and closing completely the nozzle tip (no vacuum leakage). Closing the nozzles can be done, for instance, with a piece of rubber.

A) Pick level adjustment:

When a nozzle descends and picks a component no air is allowed to enter the nozzle so the vacuum sensor detects an increased vacuum. When this level becomes higher than the preset pickup vacuum level, the machine assumes the nozzle has picked up a component.

The pickup vacuum level should be preset for each head, for a level that is slightly higher (offset is 5) than the minimum vacuum level maintained when the nozzle is open (no component at the nozzle)

1) Press the emergency button and attach nozzle 31 to all heads.
2) Cancel the emergency stop and press the ready button.
3) Execute the vacuum level utility by selecting menu **MAINTE/M - MCH_ADJUST - B1 ADJUST TARGET** and select **'Vacuum Level'**. See figure 7-5.
4) To adjust the machine low level, select the "ALL" and "Pick" from the menu. The **'All'** choice will allow the adjustment of all heads at the same time. The **'Key-In'** option will prompt the user to select any of the eight heads.
5) After the above choices have been made, VIOS prompts the user to input a vacuum offset. This is to create a safe 100% working range. Generally an offset of **5** is a correct value. However when using nozzle 31 (small components), changing the offset from 5 to 0 will increase the vacuuum range. This will allow a better distinction between an open and a closed nozzle. Enter this value and press <ENTER>. See figure 7-5
6) Press enter to start the measurement, the pickup vacuum level is measured for 8 to 20 seconds, then the results are displayed.
7) The pick up level will be measured for 8 to 20 seconds. After that the results will be displayed. See also figure 7-5.
8) Select <B2 Save DATA> or <B0 save & quit> and press enter.

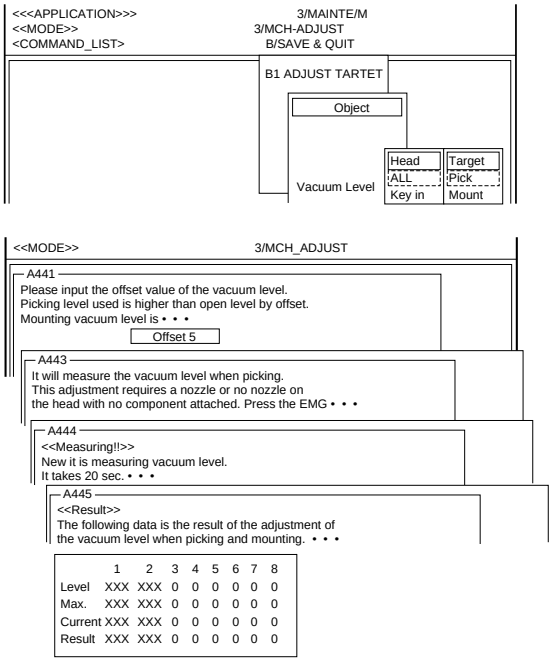

<<<APPLICATION>>>
3/MAINTE/M
<<MODE>>
3/MCH-ADJUST
<COMMAND_LIST>
B/SAVE & QUIT
B1 ADJUST TARTET
Object
Head
Target
ALL
Pick
Vacuum Level
Key in
Mount
<<MODE>>
3/MCH_ADJUST
A441
Please input the offset value of the vacuum level.
Picking level used is higher than open level by offset.
Mounting vacuum level is • • •
Offset 5
A443
It will measure the vacuum level when picking.
This adjustment requires a nozzle or no nozzle on
the head with no component attached. Press the EMG • • •
A444
<<Measuring!!>>
New it is measuring vacuum level.
It takes 20 sec. • • •
A445
<<Result>>
The following data is the result of the adjustment of
the vacuum level when picking and mounting. • • •
1 2 3 4 5 6 7 8
Level XXX XXX 0 0 0 0 0 0
Max. XXX XXX 0 0 0 0 0 0
Current XXX XXX 0 0 0 0 0 0
Result XXX XXX 0 0 0 0 0 0

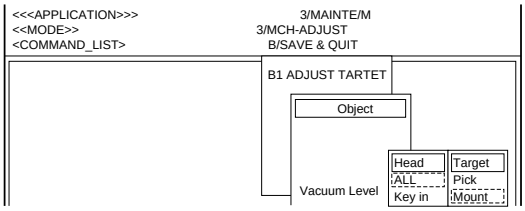
Figure 7-5 Vacuum results

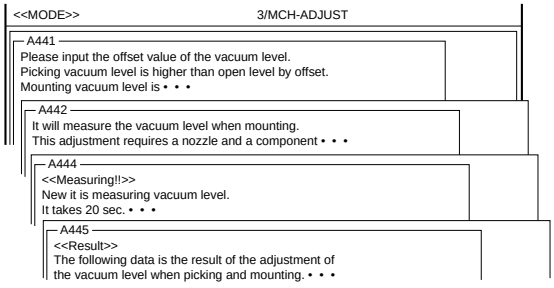
B) Mount level adjustment

When a nozzle descends to mount a component onto the PCB the vacuum pressure at the nozzle is instantaneously inverted to a positive pressure, so the detected value of the vacuum sensor decreases. When this level becomes lower than the preset mount vacuum level the machine assumes the component has been separated from the nozzle and mounted onto the PCB.

The mount vacuum level should be preset for each of the eight heads at a slightly lower (offset is 5) value than the maximum vacuum level when the nozzle opening is sealed.

1) Go to menu **MAINTE/M - MCH_ADJUST - B1 ADJUST TARGET** and select **'Vacuum Level'**. See figure 7-6.
2) To adjust the machine low level, select "ALL" and "mount" from the menu. The **'All'** choice will allow the adjustment of both heads at the same time. The **'Key-In'** option will prompt the user to select one of the heads 1 to 8.
3) After the above choices have been made, VIOS prompts the user to input a vacuum offset. This is to create a safe 100% working range. Generally an offset of **5** is a correct value. However when using nozzle 31 (small components), changing the offset from 5 to 0 will increase the vacuuum range. This will allow a better distinction between an open and a closed nozzle. Enter this value and press <ENTER>. See figure 7-6
5) Press the emergency stop button and seal the nozzle holes of the applicable heads with adhesive tape, make sure no air leak can occur.
6) Release the emergency stop and press ready followed by ENTER. Now the mount level will be measured for 8 to 20 seconds. After that the results will be displayed. See also figure 7-6
7) Select <B2 Save DATA> or <B0 save & quit> and press enter.



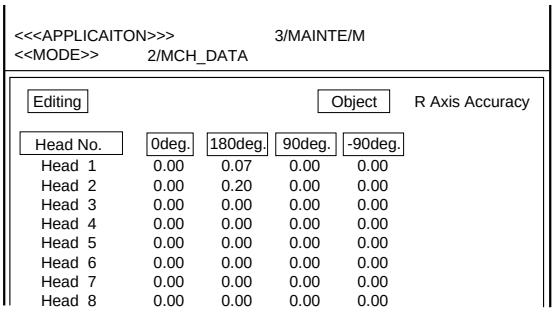

<<MODE>>
3/MCH-ADJUST
A441
Please input the offset value of the vacuum level.
Picking vacuum level is higher than open level by offset.
Mounting vacuum level is • • •
A442
It will measure the vacuum level when mounting.
This adjustment requires a nozzle and a component • • •
A444
<<Measuring!!>>
New it is measuring vacuum level.
It takes 20 sec. • • •
A445
<<Result>>
The following data is the result of the adjustment of
the vacuum level when picking and mounting. • • •

	1	2	3	4	5	6	7	8
Level	XXX	XXX	0	0	0	0	0	0
Min.	XXX	XXX	0	0	0	0	0	0
Current	XXX	XXX	0	0	0	0	0	0
Result	XXX	XXX	0	0	0	0	0	0

Figure 7-6 Vacuum results

7.2.4. R-axis Absolute Accuracy Offset

This is the angular offset for the R-axis that rotates each nozzle shaft to mount the component. When you select <3/2/A1 select target>/ "R-axis accuracy" + Enter the current offset settings for the mounting angles 0, 180, 90 and –90 are displayed as shown below.



Head No.	0deg.	180deg.	90deg.	-90deg.
Head 1	0.00	0.07	0.00	0.00
Head 2	0.00	0.20	0.00	0.00
Head 3	0.00	0.00	0.00	0.00
Head 4	0.00	0.00	0.00	0.00
Head 5	0.00	0.00	0.00	0.00
Head 6	0.00	0.00	0.00	0.00
Head 7	0.00	0.00	0.00	0.00
Head 8	0.00	0.00	0.00	0.00

Figure 7-7

Note
These off-sets are automatically corrected when you execute the mount feedback (Vision). Since the position at "0-degree" is used as a reference, it is always set to "0.00"

To determine these offsets use the R-axis accuracy routine in the maintenance manager. The machine automatically evaluates these offset settings by recognizing the component that a head picks up while rotating the nozzle shaft at the four angles.

Two situations can be distinguished:

- Topaz with only the multi-camera installed
  When the multi-camera with the reference mounting angle specified at 0 degrees is used, mountings at 90, 180 and –90 might deviate slightly. This deviation or offset can be corrected with the R-axis accuracy command in which the multi-camera recognizes a QFP component at the four mounting angles to determine the offset with respect to the recognition result at 0 degrees. Since the 0 degree parameter is used a s a reference it is set to 0.00 degrees.

- Topaz with an optional single camera installed
  When a single-camera with the reference mounting angle specified at 90 degrees is used, mountings at 0, 180 and –90 might deviate slightly. This deviation or offset can be corrected with the R-axis accuracy command in which the multi-camera recognizes a QFP component at the four mounting angles to determine the offset with respect to the recognition result at 90 degrees. Since the 90 degree parameter is used a s a reference it is set to 0.00 degrees.

Note
The R-table will always show the 90 degree as a reference, so the value in this table is always 0.00. In case the multi-camera is used as a reference internally a calculation is carried out to get the correction for the other angles 90, -90 and 180 degrees.

Preparing the component and nozzle

Prepare a QFP component to be used as a reference. Preferably a large popular QFP of known size which is registered in the component database.
Example is QFP 100-P0.65.7L. Press the emergency button and attach a QFP nozzle (type 33) to each head.

Calibrating the R-axis accuracy

Follow the procedure below:
- Cancel the emergency stop and select <3/3/B1 adjust target> "R-axis accuracy" and press Enter.
- Enter the head number and press Enter.
- Enter the component database number of the component you prepared and press Enter.
- Enter the feeder set number where you can easily attach the QFP manually to the nozzle and press the Enter key.
- Press the emergency button and attach the QFP by hand to the head to be adjusted. The QFP should be aligned with the long side parallel to the conveyor.
- Cancel emergency (+ready) and press Enter. The head will move to the camera and recognise the QFP at each angle, the results are displayed on the right side of the screen.
- Perform the same procedure for all other heads.
- Save the calibrated data by pressing ESC and the appropriate save command.

7.2.5. Nozzle Correction

This parameter is used to correct an off-center nozzle shaft when it rotates by 180 degrees. When you select << 2/ MCH_DATA >>/< A/ MCH_DATA > / { A1/ SELECT TARGET } / "Nozzle Correction" and press the [ENTER] key, the current setting for this offset is displayed.

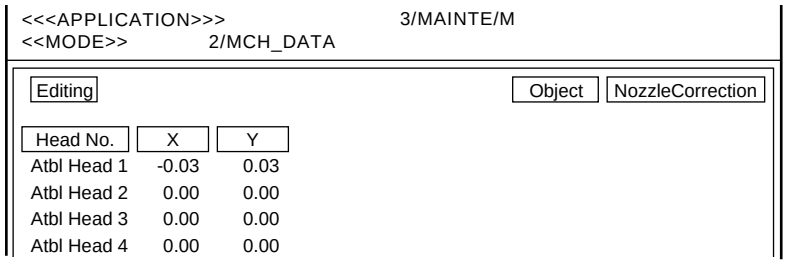


Figure 7-8

Note
This offset is automatically corrected when you execute mount feedback (Vision).

7.2.6. Head Offset

This is the position of Heads 2-8 related to Head 1. When you select << 2/ MCH_DATA >>---> < A/ MCH_DATA > ---> { A1/ SELECT TARGET } ---->"HeadOffset" and press the [ENTER] key, the current setting for this offset is displayed.

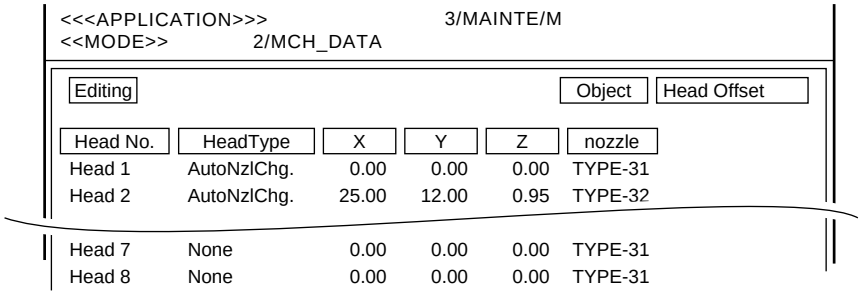

<<<APPLICATION>>> 3/MAINTE/M
<<MODE>> 2/MCH_DATA
Editing
Object
Head Offset
Head No. HeadType X Y Z nozzle
Head 1 AutoNzlChg. 0.00 0.00 0.00 TYPE-31
Head 2 AutoNzlChg. 25.00 12.00 0.95 TYPE-32
Head 7 None 0.00 0.00 0.00 TYPE-31
Head 8 None 0.00 0.00 0.00 TYPE-31

Figure 7-9

Note

This offset is automatically corrected when you execute mount feedback. Since the position of Head 1 is used as a reference, this is always set to "0.00".

7.3. Nozzle Station

7.3.1. Nozzle Station

The nozzle station of the Topaz can hold a total of 12 nozzles (11 standard nozzles and 1 optional nozzle).

Automatic nozzle change can be performed with heads 1,3,5 and 7. Nozzle change on heads 2,4,6 and 8 has to be done manually but are normally equipped with a type 31 nozzle.

To perform a smooth nozzle change, the following items should be adjusted correctly.
- Nozzle clamp plate position
- Amplifier gain for nozzle sensor
- Nozzle station coordinates

Figure 7-10 shows the nozzle station and the station nozzle positions.

Example: 1/H1/34/NN01 means
- Station 1
- Used by head 1
- Equipped with type 34 nozzle.
- Nozzle sensor input NN01.

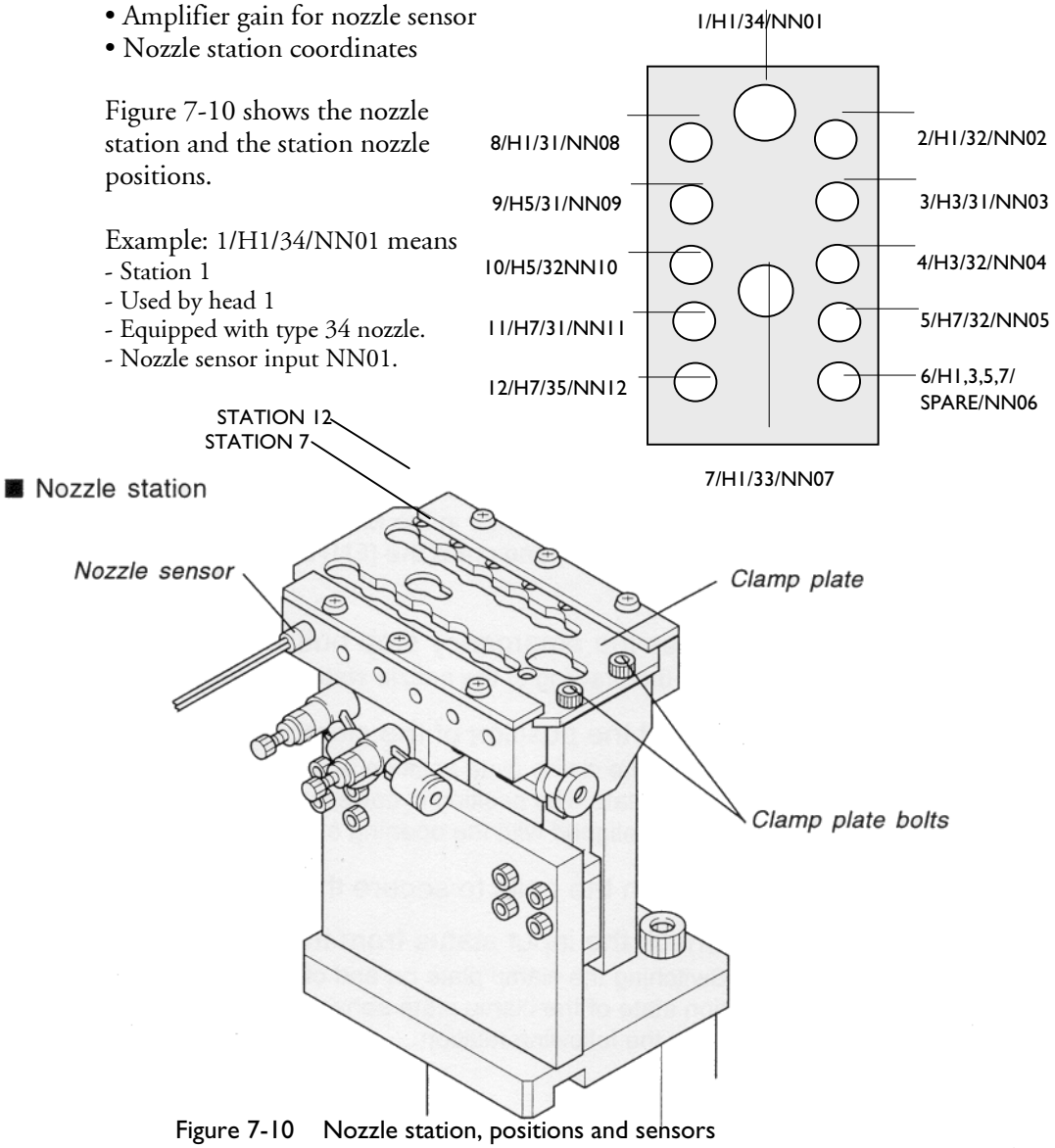


Figure 7-10 Nozzle station, positions and sensors

7.3.2. Adjusting the Nozzle Sensor Sensitivity

Each nozzle holder in the nozzle station has a sensor that detects the presence of the nozzle, allowing the machine to identify which type of nozzle is currently attached to each head. The nozzle sensor is separated from its amplifier unit which is installed inside the machine, just behind the left side of the front feeder plate. Since a gain control is provided on the amplifier, the nozzle sensor sensitivity can be checked and adjusted if necessary, as described below.

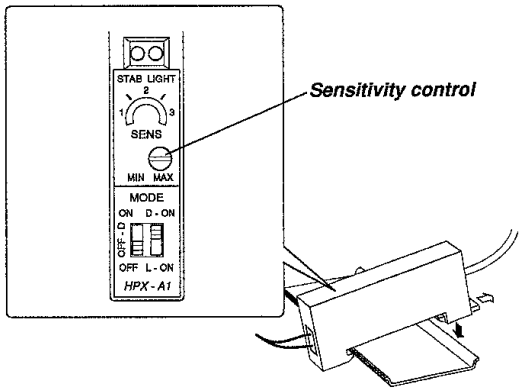


Figure 7-11 Nozzle sensor amplifier

Open the output monitor and release the nozzle clamp plate.

1. Select <<3/MAINTE/M>>>/<<4/MANUAL>>/<C/DISPLAY&EXIT>/ {C1/OUTPUT MONITOR} and press the [ENTER] key.
2. Line up the cursor with “TP02” (FRONT NOZZLE STATION CLAMP).
3. Press the [ENTER] key to open the clamp plate.
   The output monitor digit reads “0” when the clamp plate is currently closed, and reads “1” when it is opened.

Out Monitor [↑↓←→] : Select [Enter] : Exec Selected Arm : MAIN XY
[ESC] : Command Lists Moving Speed : 100

TP02 FRONT NOZZLE STATION CLAMP
CLAMP 0 / OPEN 1
(NP14= 1 / NP14= 0)

NAME	OUT		NAME	IN	
Nzl Clamp/Spare	TP01-08	01000000			
			Nzl Clamp/Spare	NP09-16	00000100

Figure 7-12 Nozzle clamp in output monitor

4. Press the emergency stop button, and insert a nozzle into the nozzle holder you want to check.
5. Open the input monitor and select the correct nozzle sensor.
   Press the [TAB] key to move the cursor into the input monitor window.
   Line up the cursor with the digit for the corresponding sensor from among "NN01" to "NN10", see figure 7-10.

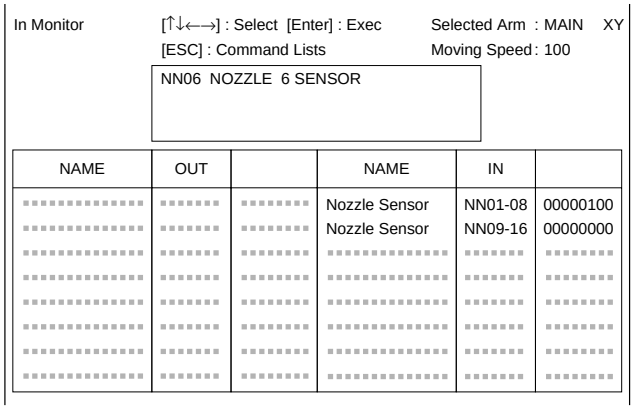


Figure 7-13 Nozzle sensors in input monitor

   To match the nozzle holder No. (or nozzle station No.) and the sensor input display code, see figure 7-10.

4. Check the input status of the selected sensor.
   The digit reads "0" when the nozzle is stored in the holder, but reads "1" when it is not. If the digit reads "1", the amplifier gain for the nozzle sensor is too low. Gradually turn the gain control of the amplifier clockwise until the digit reads "0".
5. Take the nozzle out of the holder and check the input status.
   Check if the digit has changed to "1". If not, the amplifier gain is set too high. Turn back the gain control of the amplifier slightly to the left so that the digit reads "1".

Caution

Do not change the amplifier's MODE selector setting. With this setting, the red and green LED's of the amplifier are both lit when the nozzle is in the holder, and only the green LED is lit when not in the holder.
If this detection still occurs even after you have adjusted the amplifier gain, the position of the nozzle sensor is probably incorrect. Loosen the set screw located on the bottom of the nozzle station and make adjustment to the sensor position.

7.3.3. Adjusting the Nozzle Clamp Plate Position

The nozzle clamp plate is located on the top surface of the nozzle station. It opens to allow a head to extract a nozzle from the nozzle station, or closes to lock a nozzle in place and extract it from the head.

The nozzle clamp plate opens and closes by means of an air cylinder while the position of the plate (air cylinder) is detected by a sensor. If the position is not correct trouble may occur during the nozzle change. If nessecary adjust the clamp plate as follows:

- Open the clamp plate by activating TP02 (Front nozzle station clamp) in the output monitor. A "1" means the clamp is open.
- Press the emergency button and loosen the clamp plate bolts (see figure 7.3-1).
- Adjust the position of the clamp by using the play of the mounting holes. The position is correct when the aperture of each nozzle station is exactly aligned with the holes in the clamp plate.
- Tighten the bolts in the clamp plate.
- Check the status of the clamp plate sensors as in following table:

Output	Input
TP02 = 0 (clamp)	NP13 = 0 NP14 = 1
TP02 = 1 (open)	NP13 = 1 NP14 = 0

7.3.4. Adjusting the Nozzle Station Coordinates

The position of each nozzle holder in the nozzle station is defined as a set of the X, Y, Z and R coordinates (the R coordinate is used since some nozzles have an orientation). Each head moves according to these coordinates to extract a nozzle from or deposit a nozzle into the nozzle holder. These coordinates are set at the factory prior to shipment. There will be no need for adjustment under normal conditions. If for some reason adjustment is necessary, proceed as follows:
(The following gives an example for adjusting the coordinates of Nozzle Station 1. Use the same procedure for other nozzle stations.)

1. Open the output monitor and release the nozzle clamp plate.
   Select<<3/4/<C/DISPLAY&EXIT>/<C1/OUTPUT MONITOR> and press the [ENTER] key. Use the arrow keys to line up the cursor with "TP02" (FRONT NOZZLE STATION CLAMP).
   Press the [ENTER] key to open the clamp plate.
   The output monitor digit reads "1" when the plate is opened, and reads "0" when it is closed.

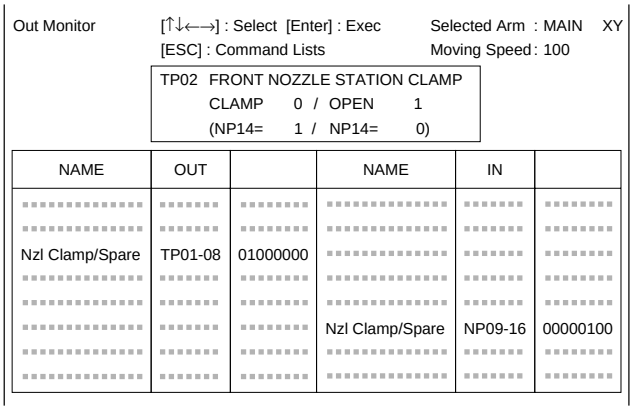


Figure 7-14

2. Select the axis to display the coordinates on the monitor.
   Press the [SEL AXIS] key of the HHK to select the axis "MAIN/X, Y".
   Raise the nozzle station in the manual screen.
3. Press the emergency stop button.
4. Attach a Type 34 nozzle to Head 1 by hand.
   Type 34 nozzle is used only for Head 1.
5. Move the head assembly by hand to over the nozzle station.
   Move the head assembly so that the nozzle tip is positioned directly above Nozzle Station 1.

Caution

When moving the head assembly, do not push on the camera or head shaft. The settings for the coordinates may become unreliable.

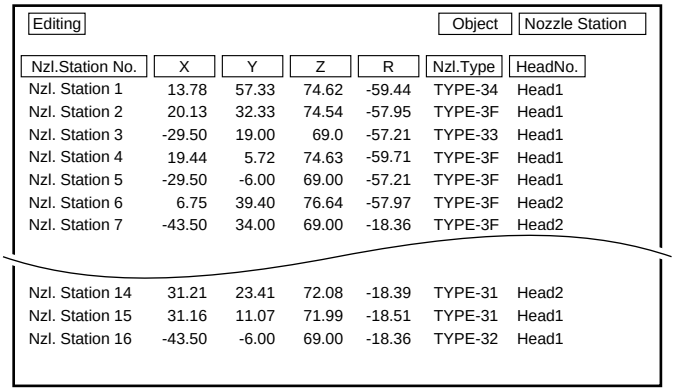
6. Align the orientation of the nozzle. Turn the nozzle shaft by hand so that the notch on the nozzle is aligned with the stop pin (for preventing rotational offset) in the nozzle holder. At this point, check that the R coordinate displayed on the bottom of the output monitor screen shows a value within ±90 degrees. If not, detach the nozzle, turn it 180 degrees and then re-attach it to Head 1.
7. Lower Head 1 to insert the nozzle into the nozzle station.
   Activate head 1 pneumatically and move the head assembly downwards until the nozzle clicks smoothly into place in the nozzle holder. Then, further lower the head until it stops in the nozzle holder.

Reference

Turning the coupling assembly located between the motor and the ball screw allows for easy minute movement of the X-axis and Y-axis. For the vertical movement of the Z-axis, it is advisable to gently press the metallic plate (lower limit detection dog) downwards or pull upwards attached to the nozzle shaft.

8. Check the X, Y, Z1 and R1 coordinates. Make a note of the readings displayed on the bottom of the output monitor screen.
9. Open the nozzle station coordinates screen.
   Select <<<3/ 2/A/{ A1/ SELECT TARGET }/"Nozzle Station" and press the [ENTER] key.

10. Enter the X, Y, Z1 and R1 coordinates. Enter the X, Y, Z1 and R1 coordinates you made a note of in Step 8, along the "Nzl. Station 1" row.



Editing | Object | Nozzle Station

Nzl.Station No.	X	Y	Z	R	Nzl.Type	HeadNo.
Nzl. Station 1	13.78	57.33	74.62	-59.44	TYPE-34	Head1
Nzl. Station 2	20.13	32.33	74.54	-57.95	TYPE-3F	Head1
Nzl. Station 3	-29.50	19.00	69.0	-57.21	TYPE-33	Head1
Nzl. Station 4	19.44	5.72	74.63	-59.71	TYPE-3F	Head1
Nzl. Station 5	-29.50	-6.00	69.00	-57.21	TYPE-3F	Head1
Nzl. Station 6	6.75	39.40	76.64	-57.97	TYPE-3F	Head2
Nzl. Station 7	-43.50	34.00	69.00	-18.36	TYPE-3F	Head2
Nzl. Station 14	31.21	23.41	72.08	-18.39	TYPE-31	Head2
Nzl. Station 15	31.16	11.07	71.99	-18.51	TYPE-31	Head1
Nzl. Station 16	-43.50	-6.00	69.00	-18.36	TYPE-32	Head1

Figure 7-15 Nozzle station coordinates screen

11. Save the settings.
    Press the [ESC] key, then select {A0/SAVE&QUIT} or {A2/SAVE} and press the [ENTER] key.
    To quit without saving, select {A7/ABORT&QUIT} and press the [ENTER] key.
12. Cancel emergency stop. Ensure safety, then release the emergency stop button and press the [READY] button of the HHK.
13 Check that the nozzle can be exchanged smoothly.
    To check, use the {A5/CHANGE NOZZLE} command in the Machine Adjust mode.

Note

When you need to adjust other nozzle stations, use the same procedure described above. Be careful to use the correct head specified for each nozzle station

The list of nozzle location and type can be found in figure 7-15.

7.3.5. Nozzle Station Maintenance

Check at a regular interval (quarterly) the following functions of the nozzle station.

- Check if the nozzles are going smoothly in and out of the nozzle holder. For a readjustment see the previous paragraphs of this chapter.
- Check if the sensing of the nozzle is done in a proper way. Use the adjustment described in the previous paragraphs to correct this.
- Check for wear and debris in and around the nozzle station. Clean the station and apply a little grease on the moving surfaces of the clamp-plate.

7.4. Feeder Plates

This section describes how to adjust the position of the feeder plates and their machine data in order that each head properly picks up a component. Also explained are adjustments to feed pitch of tape feeders. Correct adjustment of the feeder plates is essential to the proper working of the system. Improper adjustment will reduce the component pickup rate of each head. The second part of this chapter explains how to adjust the feed pitch and speed of the tape feeders.

7.4.1. Feeder Plate Parallel Adjustment

The feeder plate is secured to the feeder base of the main unit by bolts. Under normal working conditions, the feeder plate will not require parallel adjustment. However, if you need to remount the feeder plate for some reasons, first make the parallel adjustment as follows. (Fine adjustments to feeder positions will be performed in the next section "7.4.2. Teaching the feeder block positions".) Mount two feederbar adjustment blocks on the feederbar, at the end and beginning.

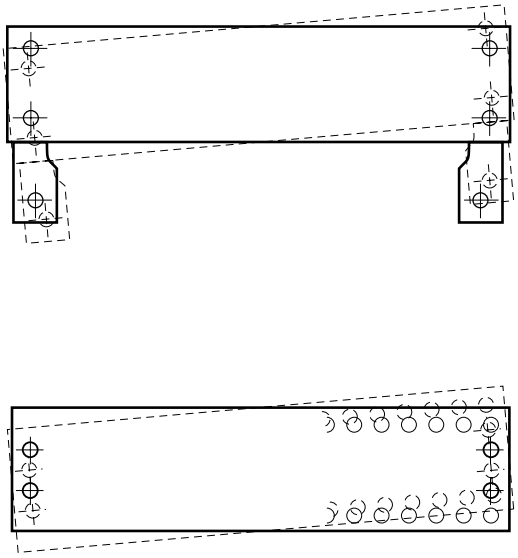


Figure 7-16 Feeder plates (top view)

1. Check if a nozzle is attached to a head.
   A nozzle for small chip components (example: type 31) is recommended.
2. Press the emergency stop button.
3. Temporarily fasten the feeder plate to the feeder base.
   Tighten the bolts, but not to fast, in the center position of each counter bored hole so that the feeder plate can be swiveled when making the parallel adjustment.
4. Set the two feederbar adjustment blocks on the feeder plate.
   The blocks must be the same type and hold the same type of components. Set the two blocks far apart as possible as long as you can access the bolts securing the feeder plate (for example, 2 or 3 points inside the both ends of the feeder plate).

7. Go with the head to one block and lower the nozzle by hand to the middle of the cross and check the position.
   Note the position of the nozzle tip relative to the chip component, especially in the Y direction.
8. Then, move the head assembly by hand to the other block.
   Making sure that the nozzle does not interfere with the blocks, move the head assembly only in the X direction so that it is positioned above the feeder.
9. Lower the nozzle by hand and check the position.
   Look at the position of the nozzle tip relative to the middle of the block, especially in the Y direction.
10. Compare the above two positions.
    If the two positions are nearly the same in the Y direction, no further adjustment is needed at this point. If shifted too far, the plate is not parallel with the X-axis. Proceed with Step 11.(Fine adjustments will be performed in the next section "7.3.2 Teaching the feeder block positions".)
11. Adjust the orientation of the feeder plate.
    Loosen the bolts that temporarily fasten the feeder plate, then carefully slide the plate so that it is set parallel to the X-axis.
12. Re-tighten the bolts securely.
    Then, advance to the next step in "7.3.2. Teaching the feeder block positions".

7.4.2. Feeder Block Positions

On each of the two feeder plates, 50 feeder set positions (pickup positions) are provided. These pickup positions are divided into seven feeder blocks per plate, as shown below. Each feeder block is comprised of eight feeder positions, except the rightmost feeder block (PF7, PF15) on each plate, which consists of two feeder positions. The first feeder set position of each feeder block is specified as a reference position. Therefore, feeder set positions of No. 1, 9, 17, 25, 33, 41 and 49 on the front plate, and No. 101, 109, 117, 125, 133, 141 and 149 on the rear plate are used as reference positions.

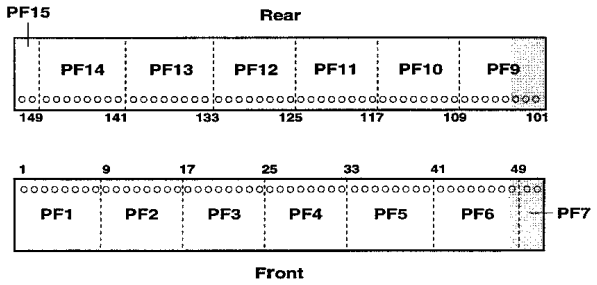


Figure 7-17 Feeder block arrangement

CAUTION
Due to the configuration design of the Topaz head assembly, the feeder set positions that can be actually accessed by each head are limited to No. 1 to 47 on the front side and No. 104 to 150 on the rear side (94 positions in total). Accordingly, to teach the reference position No. 101, use No. 104 instead and add 48.00mm to the X coordinate determined. (One pitch of the feeder set positions equals to 16.00mm.) The Y coordinate will be the same as feeder position 104.

To perform teaching for the reference position of each feeder block, proceed as follows. (You can use either head for teaching.)

1. Check if a nozzle is attached to the head.
   A nozzle for small chip components (example: type 31) is recommended.
2. Press the emergency stop button.
3. Set a tape feeder at a reference feeder position.
   Use a tape feeder you have used for the parallel adjustment in the preceding section.
4. Open the shutter of the tape feeder.
   Refer to Step 5 of chapter 7.4.1.
5. Move the head assembly by hand to over the tape feeder.
   While lowering the nozzle, position the head assembly so that the nozzle tip is at the center of the component pickup position.
6. Open the feeder plate offset screen.
   Select <<<3/2/A/{A1/SELECT TARGET}/"FeederPlateOffset" and press the [ENTER] key.

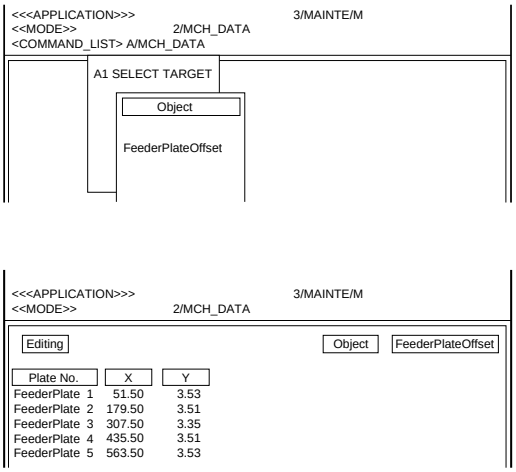


Figure 7-18 Feeder plate offset editing screen

7. Line up the cursor with the "X" column of the feeder block you are teaching.
8. Press the [F10] key. The menu window for selecting teaching conditions then appears.
9. Set teaching conditions.
   1. Select the teaching unit and press the [ENTER] key.
   The head No. you are using for teaching must be selected.
   2. Select any speed from "Speed 1" to "Speed 5" and press [ENTER].
10. Press the [F10] key twice to perform teaching.

The X coordinate value of the reference feeder position is entered.

11. Then, line up the cursor with the "Y" column.
12. Press the [F10] key twice to perform teaching.
    The Y coordinate value of the reference feeder position is entered.
13. Repeat the process for other reference feeder positions. Use the above steps, installing the same tape feeder in each reference feeder position.
14. Save the settings.
    Press the [ESC] key, then select {A0/SAVE & QUIT} or {A2/SAVE} and press the [ENTER] key. To quit without saving, select {A7/ABORT&EXIT} and press the [ENTER] key.
15. Perform the component pickup test to check the settings. This test should be performed for all reference feeder positions. (Refer to the next section "7.4.3 Component pickup test".) If any offset is found, correct it on the feeder plate offset screen.

7.4.3. Component Pickup Test

To check component pickup position or pickup function, you can use the component pickup test command. Install in advance a tape feeder in the feeder set position where you want to perform the component pickup test. It's recommended to perform the test with the smallest available component (0402/1005). Refer also to figures 7-23 and 7-24.

1. Execute the component pickup test.
   Select <<3/3/A{A3/PICK COMPONENT} and press the [ENTER] key.
2. Enter the database No. of the component and press [ENTER] .
3. Enter the head No. and press the [ENTER] key. Specify the head No. for which you want to perform the component pickup test.
4. Enter the feeder set No. and press the [ENTER] key. Specify the feeder set No. at which you have installed the tape feeder in Step 2.
5. Ensure safety, then press the [ENTER] key again.
   The head assembly starts to move, and the specified head picks up a component from the feeder.
6. Check the component pickup position.
   Look at the position of the nozzle tip relative to the component.
   If any offset is found in the X and Y directions, enter the offset on the feeder plate offset editing screen, as explained in the previous section teaching the reference feeder block positions".
7. Dump the component.
   Select {A4/DUMP COMPONENT} and press the [ENTER] key.
8. Ensure safety, then press the [ENTER] key.
   The head moves to the discard point and dumps the component automatically.

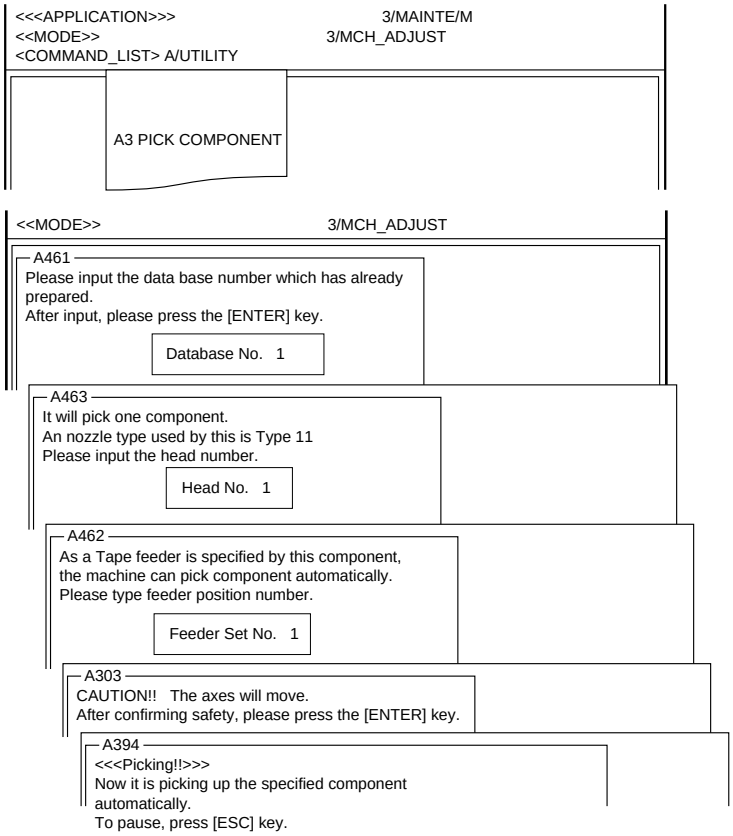

<<<APPLICATION>>> 3/MAINTE/M
<<MODE>> 3/MCH_ADJUST
<COMMAND_LIST> A/UTILITY
A3 PICK COMPONENT
<<MODE>> 3/MCH_ADJUST
A461
Please input the data base number which has already prepared.
After input, please press the [ENTER] key.
Database No. 1
A463
It will pick one component.
An nozzle type used by this is Type 11
Please input the head number.
Head No. 1
A462
As a Tape feeder is specified by this component, the machine can pick component automatically.
Please type feeder position number.
Feeder Set No. 1
A303
CAUTION!! The axes will move.
After confirming safety, please press the [ENTER] key.
A394
<<<Picking!!>>>
Now it is picking up the specified component automatically.
To pause, press [ESC] key.

Figure 7-19 Component pickup

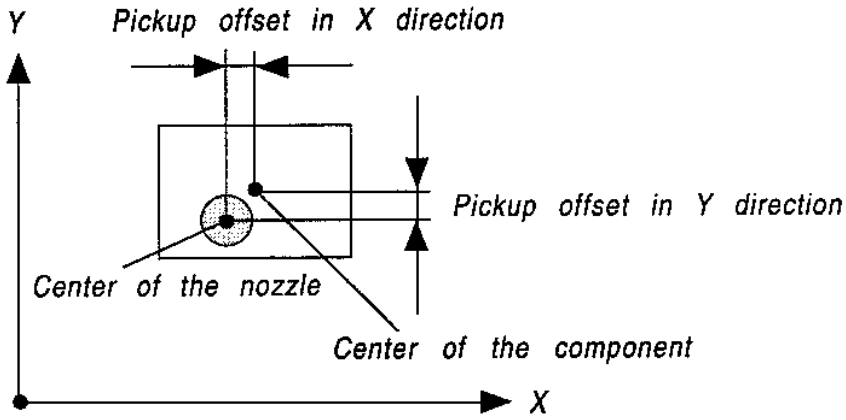


Figure 7-20 Offset of the nozzle and center position of the component

Note
In both the X and Y directions, if the nozzle tip is shifted to the machine origin side with respect to the center of the component, then this is a plus offset. If shifted in the opposite side, this is a minus offset.

7.4.4. Feeder Plate Maintenance

Check on a weekly basis the wear of the feeder-plate. Replace the air-joint if wear is noticed or if air leakage is noticed. Also a malfunction feeder can be caused by a bad air supply or bad coupling. Clean the inner part of the air coupling and apply little grease on the inner-packing of the air-joint.

Check the feeder alignment every three months. Proceed with the description given in the previous paragraph if needed.

7.5. Component Feeders

This section explains how to adjust the feed pitch and speed of tape feeders and multi-stick feeders that continuously supply components for mounting.

Refer to the CSM/GEM Feeder Manual ((5322 871 61605) for more information about tape feeders, C0603 bulk feeders and intelligent tape feeders.

7.5.1. Tape Feeders

For stable and accurate component feeding, the following items must be adjusted correctly.

Adjustment item	Tape feeder type
Feed pitch	All feeder except 8mm and 32 mm tape feeder
Feeder speed	16 mm, 24 mm, 32 mm and 44 mm tape feeders
Tape peeling load	8 mm and 12 mm tape feeders
Lock lever position	32 and 44 emboss tape feeders

Figure 7-21

Tape feeder pitch

The spacing between components on the tape (also known as the pitch) differs depending on type of components. The tape feed pitch on the tape feeder must therefore be set to match the component pitch. The table below shows feed pitches available for each type of feeder.

Tape Feeder (Model No.)	Pitch (m/m)
8mm tape feeder (PL-084)	4
8mm tape feeder for 1005 chip (PL-082)	2, 4
12mm tape feeder (PL-12)	4, 8
16mm tape feeder (PL-16)	4, 8, 12, 16
24mm tape feeder (PL-24)	4, 8, 12, 16
32mm tape feeder (PL-32)	12, 16, 20, 24, 28, 32, 36
44mm tape feeder (PL-44)	12, 16, 20, 24, 28, 32, 36
32mm adhensive tape feeder (PL-N32)	12

Figure 7-22 Tape feeder pitch

8mm (for 0402 chip) and 12mm tape feeders

To change the tape feed pitch setting, modify the position of the air cylinder on the tape feeder as described below.

1. Loosen the two screws for the air cylinder.

2. Insert the two screws into the other pair of holes.
Use number 1 holes for 4mm pitch and number 2 holes for 2mmpitch (1005 chip).

3. Tighten the screws to secure the air cylinder.

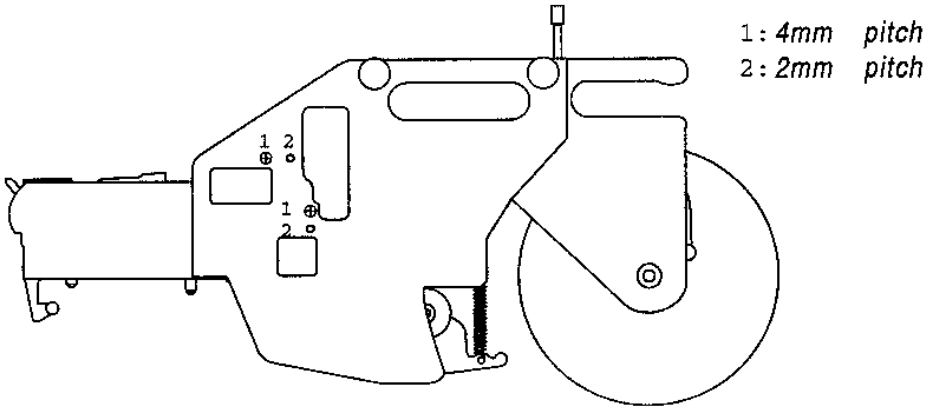


Figure 7-23 8mm (0402 chip) tape feeder

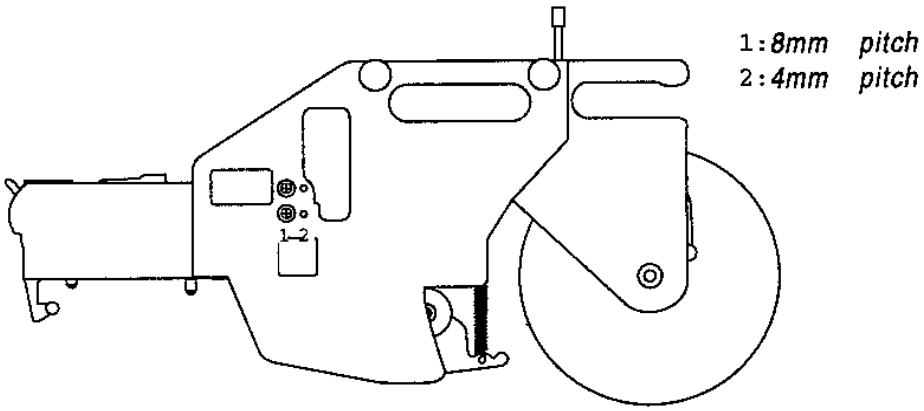


Figure 7-24 12mm tape feeder

16mm, 24mm, 32mm, 44mm tape feeders

1. Loosen the two screws on the air cylinder holder plate.

2. Fit the small pin into the desired notch in the holder plate.
   The numbers marked on the holder plate indicates the actual feed pitches in millimeters.

3. Tighten the screws to secure the air cylinder.

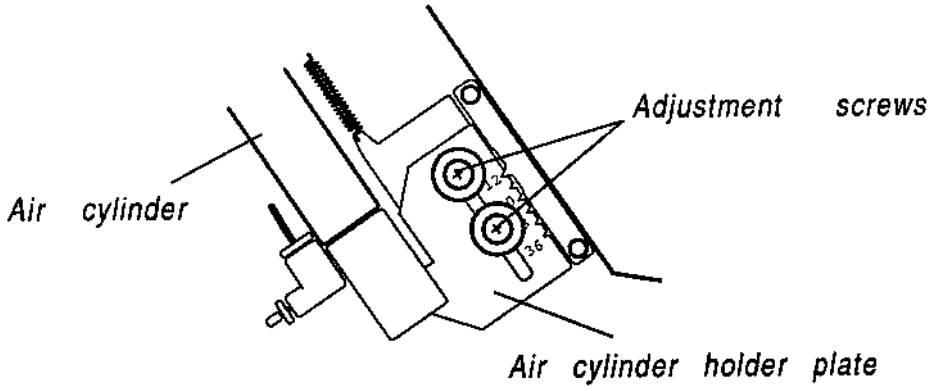


Figure 7-25 16mm, 24mm, 32mm, 44mm tape feeders

Feeder speed (for 12 LP, 16, 24, 32 and 44mm tape feeders)

The speed adjuster linked to the air cylinder of the tape feeder allows you to vary the speed at which the components are delivered. Turn the adjuster knob to the left to increase the speed, and turn it to the right to reduce the speed. The optimum speed differs depending on the component and tape. If the speed is set too fast, components may be skipped or become jammed, or the tape may come off the tape guide sprocket, preventing the components from being fed correctly. In such cases, the speed should be reduced.

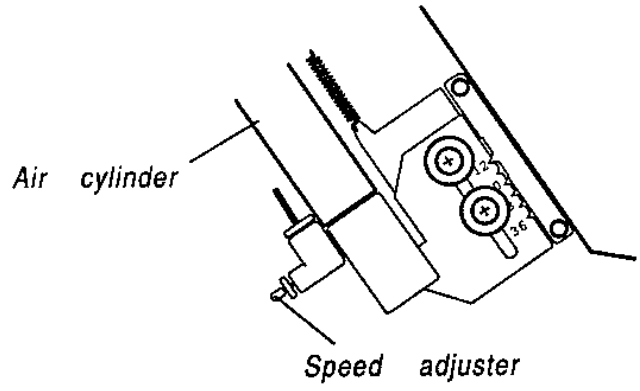


Figure 7-26

Changing the tape peeling load

a). Tape peeling load (for 8mm and 12mm tape feeders)

The top tap and carrier tap of a tape reel are glued with adhesive. If this adhesive is too strong, the top tape may not peel away from the carrier tape at proper timing (in particular, paper tape).
To increase the tape peeling load, set the spring shown in the drawing on the upper support pin.

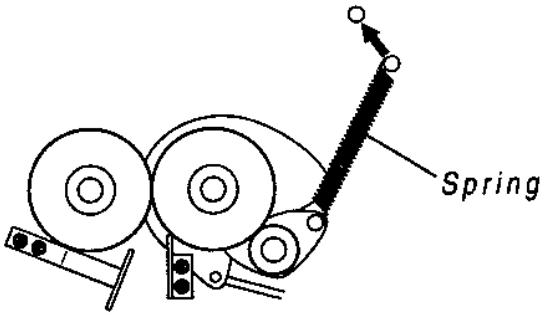


Figure 7-27

Adjusting Lock lever (for 32mm and 44mm emboss tape feeders)

If there is a gap between the tape guide and the lock lever, the tape guide may work loose and inhibit proper feeding of the components. To prevent this, adjust the lock lever as follows:

1. Press the emergency stop button and attach the tape feeder to the feeder plate.
2. Loosen the two screws securing the lock lever. Be careful not to remove the screw at this point.
3. Adjust plates A and B so that the tape guide and the lock lever touch.
4. Re-tighten the screws.

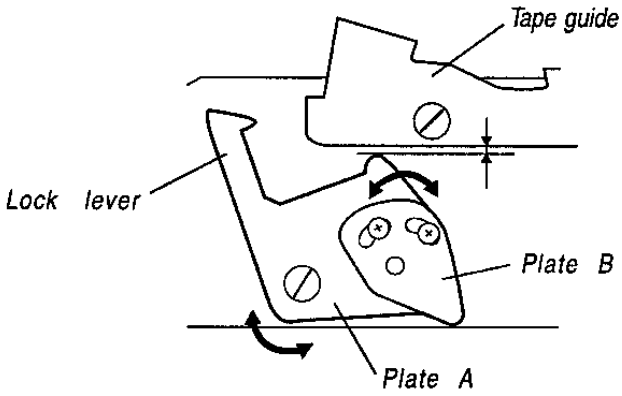


Figure 7-28 Adjusting the lock lever position

7.5.2. Minimum Timer / Load Timer / Down Timer

When a head moves down to the component pickup position, the feeder's air cylinder shaft is pushed out to open the shutter (the cylinder is on).

When the head moves up, the shaft returns (the cylinder is off) and the next component is delivered to the pickup position. If this on/off timing is not correct, component delivery errors may occur. To avoid this problem, the minimum timer and load timer must be adjusted correctly.

To check the minimum timer and load timer settings, select <<<3/MAINTE/M>>>/<<1/MCH_CONFIG>>/<A/MCH_CONFIG>/{A5/FEEDER SPEC INF.} and press the [ENTER] key. The screen appears as shown below.

```
  DATA[non                 ]
<<<APPLICATION>>> 1/OPERATION/M  2/DATA/M  3/MAINTE/M  4/SHELL/M  0/EXIT
<<MODE>> 1/MCH_CONFIG  2/MCH_DATA  3/MCH_ADJUST 4/MANUAL  0/EXIT
           PNEUMATIC Type
FeederType LeftWidt RightWid PickPos  Min.Time LoadTime DownTime Sequence
8mmTape        7.80     8.00     0.00        0        0        0 TapeType
8mm1005cmp     7.80     8.00     0.00        0       20       40 TapeType
12mmEmboss    14.50    11.20     0.00       10       30        0 TapeType
16mmEmboss    16.50    13.20     0.00       10       50        0 TapeType
24mmEmboss    20.50    17.20     0.00       10       50        0 TapeType
32mmTape      25.00    21.90     0.00       15       50        0 TapeType
32mmEmboss    24.70    22.50     0.00       50      100        0 TapeType
44mmEmboss    30.70    28.50     0.00       50      100        0 TapeType
56mmEmboss    42.50    34.50     0.00       50      100        0 TapeType
MultiStick    39.80    87.00     0.00        0      140        0 StickTyp
Fix.TF         0.00     0.00     0.00        0        0        0 TrayType
```

Figure 7-29 Feeder plate spec information screen

Minimum timer

The minimum timer is the time during which the air cylinder is kept on so that the nozzle in the lowered position can pick up a component without fail. The time is expressed in hundredths of a second.

Load timer

The load timer is the time from which the air cylinder is turned off until the next component is securely delivered to the pickup position. This is expressed in hundredths of a second.

Down timer

Time that must be allowed between the feeder shutter opening and the head being lowered onto the component (in thousandth of a second, 0-2000)

Caution:

This information is set at the factory prior to shipment. It is unlikely that you will need to change it. If, however, this information needs to be adjusted, enter the optimum settings on this screen while checking for feeder operation. To save the new settings, select {A0/EXIT} and press the [ENTER] key.

7.5.3. Tape Feeder Maintenance

Introduction

The tape feeders comply to the EIA-481 standard. The following tape feeders are available:

PA2903/70	8mm Tape Feeder, 2mm pitch, 7" Reel
PA2903/71	8mm Tape Feeder, 4mm pitch, 7" Reel
PA2903/72	8mm Tape Feeder, 4mm pitch, 15" Reel
PA2903/80	12mm Tape Feeder, 7" Reel
PA2903/81	12mm Tape Feeder, 15" Reel
PA2903/20	16mm Tape Feeder
PA2903/30	24mm Tape Feeder
PA2903/40	32mm Tape Feeder
PA2903/50	44mm Tape Feeder

Adjustment

Tape feeder adjustment (8mm to 16mm only) can be done with the Optical Tape Feeder Adjustment Tool. A user manual is included with this tool. The tool can be ordered with: PA2849/10

Preventive Maintenance for tape feeders

a) Preventive Maintenance Schedule

Item	every feeder change	Daily	Weekly	Monthly	> 1/2 million indexes	> 2 million indexes
Tape waste		clean				
Cleanliness			check			
Tape path		clean				
Transport assy		clean				
Top cover assy				clean		
Moving parts					lubricate	
Top foil wheel						replace
Bottom surface	check					

Figure 7-30 Preventive Maintenance Schedule

b) Recommended Materials:

Recommended Equipment and Materials for Cleaning and Lubricating:
Vacuum cleaner (for maintenance close to the Topaz)
Compressed air gun (for maintenance in workshop)
Pair of tweezers
Small brushes
Q-tips
Lint-free tissue paper
Isopropanol
Light machine oil (e.g. Shell Tellus 32)
Screwdriver Philips no 00
2 feeler gauges of 0.05 mm thick
Seal lock agent 063 (Locktite 603)
Punch maximal diam. 2 mm
Allen key 1.5 mm
Screwdriver (Torc no. T10)
Hammer (small)

c) Checking the Cleanliness

Frequency: Weekly
Required time: 0.1 hr. (per feeder)
Procedure:
- Check the whole tape path for contamination and clean it if necessary with a lint-free tissue paper, brushes or Q-tips, moistened in isopropanol.
- Clean the feeder with compressed air or with a vacuum cleaner to remove all dust.

d) Tape Path Cleaning

Frequency: daily
Required time: 0.1 hr. (per feeder)
Procedure
- Check if there is any tape sediment, adhesive or component debris adhering to the tape travelling surface. Special attention must be given to the tape path area underneath the top cover plate. Clean if necessary with the recommended equipment and materials.

e) Tape Transport Cleaning

Frequency: daily
Required time: 0.1 hr. (per feeder)
Procedure:
- Check if there is any dirt on the sprockets of the sprocket wheel, on the two pawls, the pawl wheel and in between the wheels.

Clean if necessary with the recommended equipment and materials. Never use a solvent otherwise the grease inside the transport assy will be dissolved.

f) Top Cover Plate cleaning

Frequency: monthly
Required time: 0.1 hr. (per feeder) see figure
Procedure:
- Unlock the lock lever (4) so that the top cover plate (1) is lifted.
- Check if the sliding lip (2) in the top cover plate is sliding smoothly.
- Clean if necessary with the recommended equipment and materials.
- If after cleaning the bracket is still not shifting smoothly, then the top cover plate must be replaced.
- Check if the top cover plate is not bent, else replace the top cover. Refer to spare part section for order numbers.
- Check if the top cover plate is not bent, else replace the top cover. For order numbers, refer to the spare parts section of this manual.

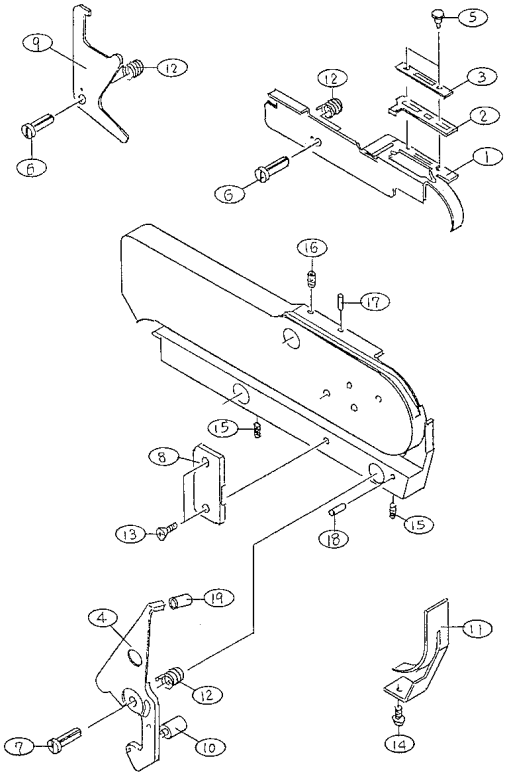


Figure 7-31 CSM top cover plate

g) Top Cover Plate replacement (see fig. 7-31)

Procedure:
Remove the top-cover plate (1) by loosening the M3 socket set screw (16) on the top of the feeder, so the shaft (6) and the top-cover plate can be removed.

Mount the new top-cover plate + spring at the same position and make sure that the spring-end falls into the slit of the shaft. Also pay attention that the lever (9) is pulled away.

Slide lip (2) to the most forward position so that the sprocket lip falls into the correct slit.

Rotate the shaft, against the spring force (clock wise), 180 degrees ± 10 degrees or 1/2 stroke. This guarantees that the slit in the shaft stands in horizontal position Secure the shaft with the socket set-screw. During rotation of the shaft push the cover-plate (with a small force) onto the body.

Check the functioning of the cover-plate before tape reel loading. Make sure that the clamp lever (9) and the top cover plate are not scoring or catching the surfaces below to maintain freedom or movement. Also the total width of the feeder front of the 8 mm feeders should not exceed 16 mm. The total width of the feeder front of the 12 mm (mechanical/air) driven feeders and the 16 mm air feeder should not exceed 20 mm.

Remark:
If the spring (12) is deformed, the complete top-cover plate must be replaced (assembly). The spring is good if the spring ends face each other 180 degrees ± 10 degrees (visual inspection).

h) Replace Gear Wheel (Small)

Frequency: Every 2 million indexes.
Required time: 10 minutes
Required Material: 1x Drive top foil wheel 5322 522 33367

Procedure:

- Loosen the countersunk screw and remove the flange and gear wheel by using a Philips screwdriver no. 00.
- Mount a new gear wheel in the reverse direction. Make sure that the gear wheel moves freely if turning it clockwise (see arrow).

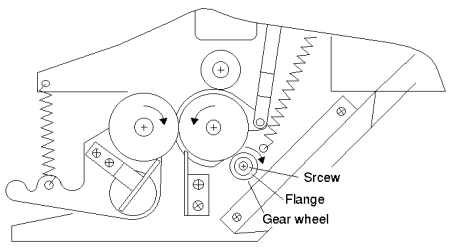


Figure 7-32 Replacing of the gear wheel (small) [SD-2355.WPG]

i) Bottom Surface

Frequency: Every feeder change
Required time: 0.1 hr. (per feeder)

Procedure:
Check if the bottom surface of the feeder is clean and free of mechanical damage.

Clean if necessary with the recommended equipment and materials.

j) Lubrication

Frequency: Every 500.000 indexes
Required time: 0.1 hr. (per feeder)

Procedure:
- Clean the 11 points that have to be lubricated (fig.7-33) and remove all dust by using a vacuum cleaner.
- Clean and remove, if necessary, old oil and dust with a lint-free tissue paper, brushes or Q-tips, moistened in denatured isopropyl + 5% methyl alcohol (has to be purchased locally).

Remark:
The fig. 7-33 shows the mechanical feeder and not the FV feeder. This is of no importance because most of the lubrication points are the same.

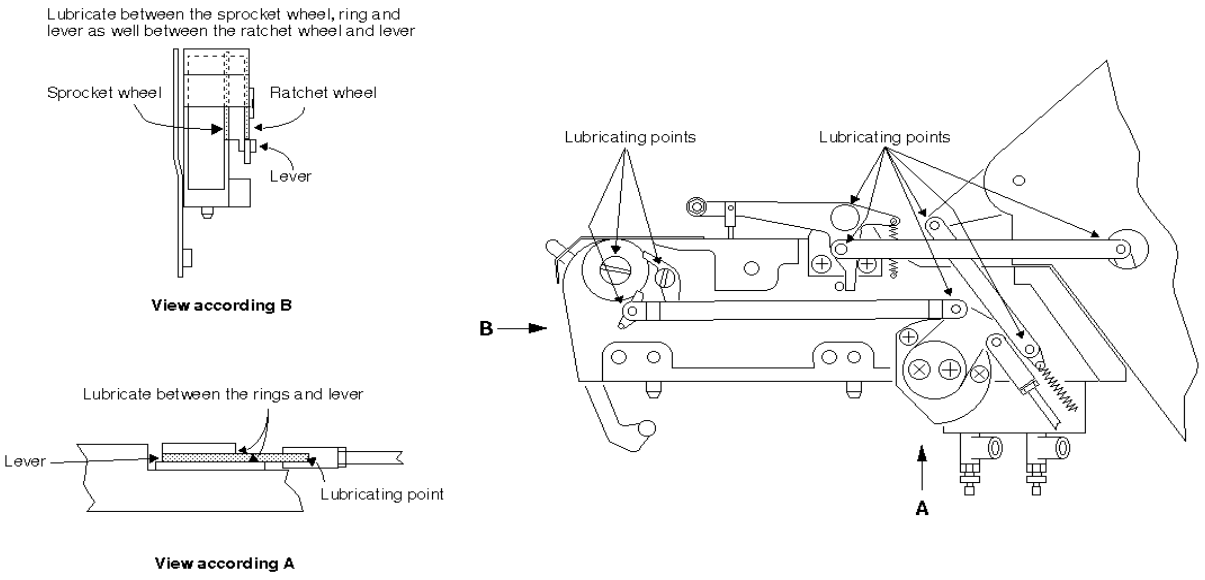
WARNING

WHEN USING DENATURED ISOPROPYL OBSERVE THE FOLLOWING SAFETY INSTRUCTIONS:

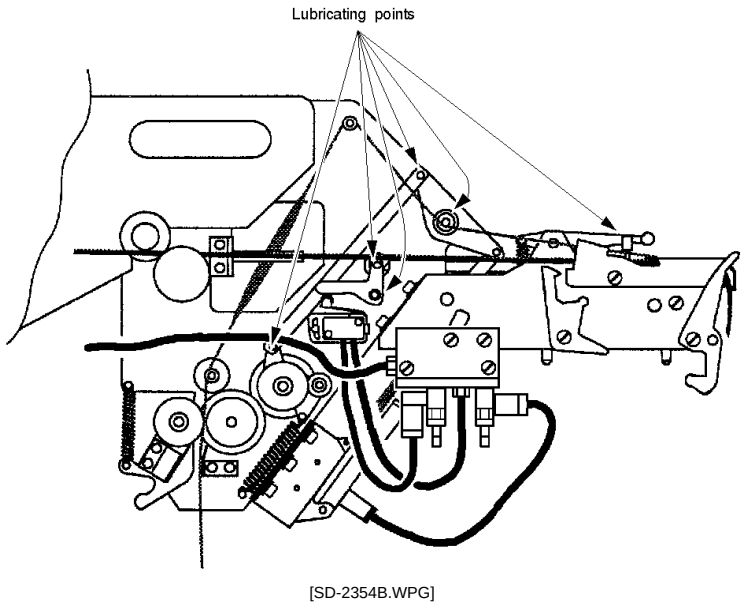
a) KEEP CONTAINER CLOSED TIGHT WHEN NOT USED.
b) KEEP AWAY FROM INFLAMMABLE SOURCES - NO SMOKING.
c) HARMFUL IF INHALED OR SWALLOWED.
d) HIGHLY INFLAMMABLE.
e) AVOID CONTACT WITH THE SKIN.
f) DO NOT EMPTY INTO DRAINS.

Add oil between the parts as shown (by arrows) in figure 7-33.
Lubricant: Tellus 32 from Shell (has to be purchased locally).
Rotate or move the parts several times so that the lubricant can spread.

Note:
The amount of lubrication oil should be a single drop supplied with a small screw driver or needle pin (has to be purchased locally). After lubrication, wipe off excessive oil to avoid contamination. Use only the type of lubricant that is mentioned above.



[SD-2354A.WPG]



[SD-2354B.WPG]

Figure 7-33 Lubrication of the rotating and moving parts (figures show mech. feeders)

Trouble shooting

Symptom description	Possible cause	Solution
Automatic refire level to high (number of re-pick actions)	Tape out of specification (diam. sprocket holes 1.6 mm max, play component in pocket 0.5 mm max)	Replace tape
	Feeder not placed correctly	Clean feeder-bar
	Feeder interface damaged	Clean feeder bottom
	Tape or cover tape path not correct or obstructed	Send feeder back for repair
	Speed air-cylinder too low	Correct path and/or remove obstructions
	Index mechanism polluted	Check adjustment
Feeder does not index correctly	Clamping lever of feeder to the left presses against index mechanism	Clean index mechanism
	Index mechanism damaged	Tighten clamping lever to the feeder body
	Cover plate not completely closed	
	Cover plate damaged	Send feeder back for repair
	Index force extremely high	Remove obstructing components
	Spring (left-pulley) broken/absent	Replace cover plate
	Spring (top-foil) broken/absent	Lubricate rotating parts
		Replace
		Replace

Symptom description	Possible cause	Solution
(continue) Feeder does not index correctly	Spring (set-up) broken/absent	Replace
Pick position wrong	See index problems	Check pick position with Tape Feeder Adjustment Tool PA 2849/10
Cover tape does not peel back from carrier tape	Tape not inserted correctly	Insert tape according instructions
	Tape stuck between wheels	Insert tape again, make sure the scrapers are close to the wheels and the double guiding is straight
	Spring (left pulley) broken/absent	Replace spring
	Spring (top-foil) broken/absent	Replace spring
	Spring (set-up) broken/absent	Replace spring
	Reel/tape stuck	Check for obstructions
	Top foil wheel (small) rotates during upward stroke	Replace small wheel
	Set up spring incorrect mounted	Check if the spring is set onto the correct fixing pin
Cover tape does not peel back from the carrier tape at the appropriate timing (specially paper tape)		

CHAPTER 8 Axes Systems

8.1. Introduction

This chapter describes the axes systems of the Topaz.

The mechanical movement of the TOPAZ systems is controlled by the five axes described in table 8-1 below.

Axis	Function	Power drive method
W axis	Adjust the width of the conveyor that carries in or out a PCB	AC motor/ ball screw
Z axis	Moves the nozzle shafts of heads 1 to 8 simultaneously in vertical direction.	AC motor/ ball screw
X axis	Moves the head assembly in parallel with the PCB transfer direction(right to left and left to right as viewed from the front of the machine)	AC motor/ ball screw
Y axis	Moves the head assy forwards and backwards as viewed from the front of the machine	AC motor/ ball screw
R axis	Rotates the nozzle shaft of the head 1-8.	AC motor/ belt drive

Table 8-1 Axes overview

To preserve the repeatability of axis movement and mounting accuracy, the following parameters must be set correctly.

Parameter	Axis
Machine reference	W, Z, X, Y, R
Secondary limit	X, Y
Software limit	W, Z, X, Y, R
Initial position	W, R
Initial movement	Z

Table 8-2 Adjustment parameters of moving axes

WARNING

MAKE SURE TO TAKE ALL NECESSARY SAFETY PRECAUTIONS WHEN DOING MECHANICAL ACTIONS AT THE SYSTEM. ALWAYS SWITCH OFF THE MACHINE IF MECHANICAL ASSEMBLY OR DISASSEMBLY ACTIONS ARE CARRIED OUT.

8.2. Machine Reference (Origin)

The built-in motor encoder of each axis issues a "0" pulse each time one turn is complete.
When return-to-origin is performed, there will be a difference in distance between the position where the origin signal is detected and the point at which the next encoder "0" pulse is received (the origin position actually set). This is called the machine reference and is usually expressed in percentages, with 100% being equal to one full turn of the motor.

■ Machine reference

10043601-00

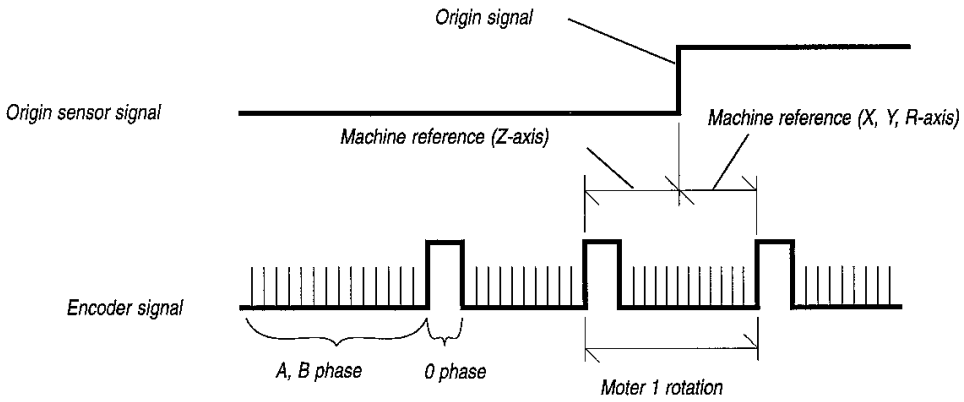


Figure 8-1 Machine reference

Check the machine reference settings.
Move the cursor to <3/MAINTE/M>>>Æ<<4/MANUAL>>Æ <B/AUTOMATIC_MOVE> Æ{B6/INIT.SERVO ORIGIN}, and press the [SHIFT]+[ENTER] key
The machine reference of each axis appears on the operation monitor after the return-to-origin has been performed.

■ Machine reference display

50543602-00

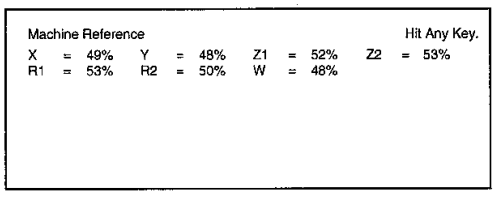


Figure 8-2 Machine reference display

8.2.1. W-axis Machine Reference

The W-axis is driven by ball screw at a lead of 5.00mm per turn of the motor. The conveyor width is adjusted by sliding the rear rail. (The front rail is fixed.) The origin signal is output when the origin sensor, which is located near the inner end of the W-axis ball screw, has detected the origin dog attached to the movable rail.

Use the following procedure to adjust the machine reference. (This is not needed for machines designed for manual adjustment of conveyor width.)

1. Press the emergency stop button.
2. Adjust the machine reference as follows.
3. Loosen the bolt securing the origin dog and slide it slightly.
   - To increase the machine reference: Slide the dog in the width enlarging direction.
   - To decrease the machine reference: Slide the dog in the width reducing direction.
4. Re-tighten the bolt to secure the origin dog, after the machine reference is set within the tolerance range.

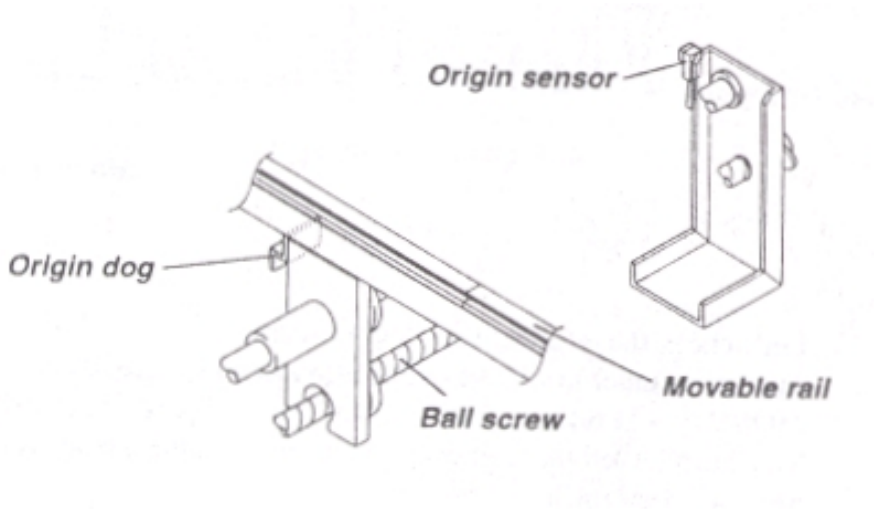


Figure 8-3 Adjusting the W-axis machine reference

Note:

The machine reference will be adjusted to about 20% for every 1mm movement of the origin dog. Be sure to slide the dog slightly (a maximum of 2.5mm). If you slide it too far, a "0" pulse in a different cycle may be received, causing the origin position to shift

8.2.2. Z-axis Machine Reference

The Z-axis vertically moves the head assembly by ball screw. When return-to-origin is performed, the Z-axis travels at low speed up against the upper end and the resulting excessive motor current is detected as an origin signal, then the origin is set at the position of the preceding encoder "0" pulse as the motor reverses slightly. (There is no origin sensor and origin dog.) To adjust the Z-axis machine reference, follow these steps.

1. Press the emergency stop button.
2. Loosen the bolt securing the coupling on the Z-axis ball screw side, refer to figure 8-4 below.
3. Adjust the machine reference; rotate the ball screw to adjust the machine reference as follows:
   - To increase the machine reference: rotate in direction A (down)
   - To decrease the machine reference: rotate in direction B (up)
4. Retighten the bolt to secure the coupling after the machine reference is set within the tolerance range.

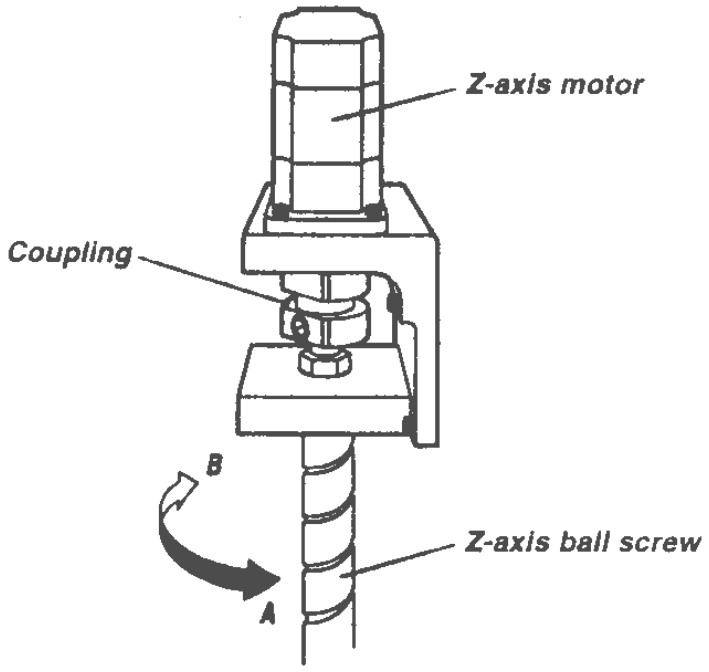


Figure 8-4 Adjusting the Z-axis machine reference

Note:

A 1mm movement of the Z-axis is equal to 25% of the machine reference. Do not allow the Z-axis to move more than 2mm. If you move too far, a "0" pulse in a different cycle may be received, causing the origin to shift. Do not allow the shaft to turn during adjustment.

8.2.3. X-axis Machine Reference

The X-axis performs the right-to-left and left-to-right movement of the head assembly. It is driven by ball screw at a lead of 20.00mm per turn of the motor. The origin signal is output when the grey origin sensor, which is attached to the bottom of the X-axis slide plate, has detected the origin dog located on the left side of the X-axis. To adjust the X-axis machine reference, proceed as follows, see figure 8-5.

1. Press the emergency stop button.
2. Adjust the machine reference as follows; loosen the screw securing the X-axis origin dog and slide it slightly.
   - To increase the machine reference: slide the dog to the right.
   - To decrease the machine reference: slide the dog to the left.
3. Re-tighten the screw to secure the origin dog. Make sure that the machine reference is set within tolerance.

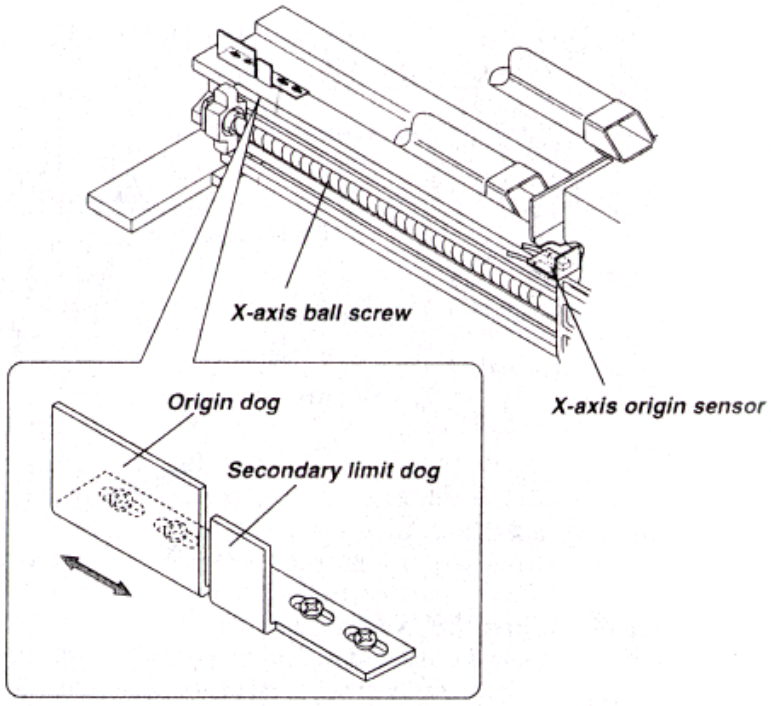


Figure 8-5 Adjusting the X-axis machine reference

Note:

The machine reference will be adjusted to about 10% for every 2mm of movement of the origin dog. Be sure to slide the dog slightly (a maximum of 10mm). If you slide it too far, a "0" pulse in a different cycle may be received, causing the origin position to shift.

8.2.4. Adjusting the Y-axis Machine Reference

The Y-axis performs the forward and backward movement of the head assembly. It is driven by ball screw at a lead of 20.00mm per turn of the motor. The origin signal is output when the grey origin sensor, which is attached to the bottom of the right-hand Y-axis slide plate, has detected the origin dog located on the forward end of the Y-axis. To adjust the Y-axis machine reference, proceed as follows, see figure 8-6.

1. Press the emergency stop button.
2. Adjust the machine reference as follows; loosen the screw securing the Y-axis origin dog and slide it slightly.
   - To increase the machine reference: slide the dog backwards (to the rear feeder plate).
   - To decrease the machine reference: slide the dog forwards (to the front feeder plate).
3. Re-tighten the screw to secure the origin dog. Make sure that the machine reference is set within tolerance.

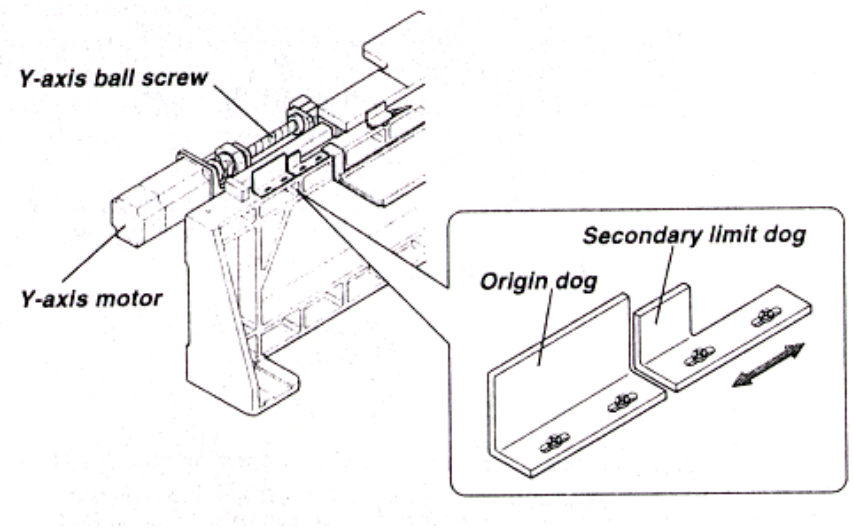


Figure 8-6 Adjusting the Y-axis machine reference

Note:

The machine reference will be adjusted about 10% for every 2mm movement of the origin dog. Be sure to slide the dog slightly (a maximum of 10mm). If you slide it too far, a "0" pulse in a different cycle may be received, causing the origin position to shift

8.2.5. R-axis Machine Reference

The R-axis performs the rotation of each nozzle. The origin sensor is attached to the lower part of each head. The origin dog is the head of a screw inserted into the dog ring located at the lower part of the nozzle shaft. When the origin sensor has detected the origin dog, an origin signal is output. To adjust the R-axis machine reference, follow these steps, see figure 8-7.

1. Press the emergency stop button.
2. Loosen the set screw for the dog ring.
   Look at the lower part of the head assembly, there is a dog ring attached to each nozzle shaft. Use a hex wrench to loosen the set screw for the dog ring you want to adjust. (Do not remove.)
3. To adjust the machine reference slightly turn the dog ring.
   - To increase the machine reference: Turn clockwise (topview).
   - To decrease the machine reference: Turn counter clockwise (topview).
4. Re-tighten the set screw to secure the dog ring. Make sure that the machine reference is set within the tolerance range.

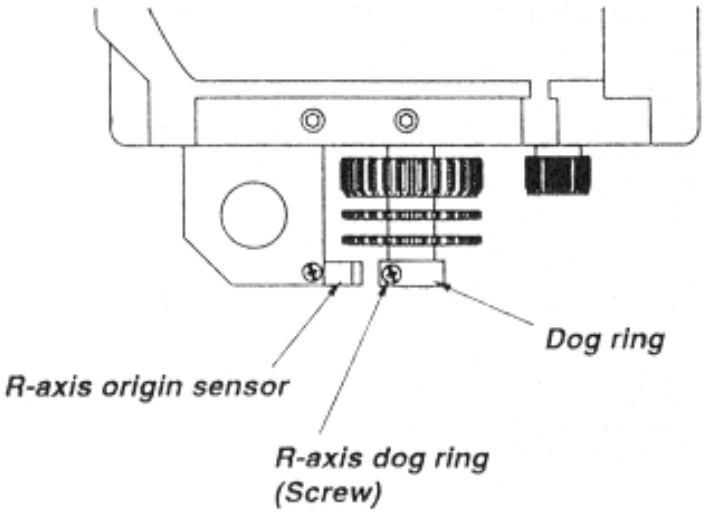


Figure 8-7 Adjusting the R-axis machine reference

Note:

Be sure to turn the dog ring slightly, if you turn it too far a “0” pulse in a different cycle may be received, causing the origin to shift.

8.3. Secondary Limits

When the head assembly runs into the secondary limit area over the software limit, the servo control immediately stops to avoid colliding with the mechanical (hard-) stopper. (A light impact may occur however, depending on the running speed.)

The secondary limit area is provided for the X and Y axes, and can be adjusted by sliding the position of the secondary limit dog located at the both ends of the movement range.

8.3.1. X-axis Secondary Limits

Usually the X-axis secondary limits are set to a point 1.00mm inside the mechanical stopper (hard limit), see figure 8-8.

1. Select the axis. Specify in advance the axis whose co-ordinates need to be displayed in Step 5. To specify the axis, select <<<3/MAINTE/M>>>/ <<4/MANUAL>>/<A/CHANGE_ CONDITION>/{A1/SELECT AXES}/"MAIN XY" and press the [ENTER] key.
2. Press the emergency stop button, then loosen the screws for the secondary limit dog. The secondary limit dogs are located at both ends of the X-axis. Slightly loosen the screws so that you can just slide the dog. (Do not remove.)

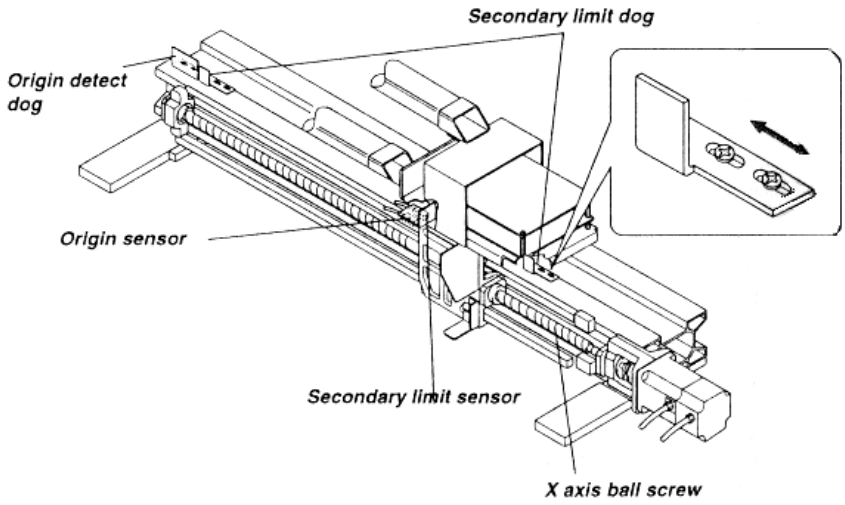


Figure 8-8 X-axis secondary limit dog

3. Move the head assembly to the end of the axis.
   Move the head assembly by hand until it makes contact with the mechanical stopper for the secondary limit dog with the bolt loosened. The blinking message "EMERGENCY STOP ON!" indicated on the lower left of the operation monitor will change to "2nd LIMIT OVER!".

4. Move back the head assembly to 1.00mm inside the mechanical stopper. To do this, open the output monitor screen (or input monitor screen), and while observing the X co-ordinate value indicated on the bottom of the operation monitor, stop the head at a position approximately 1.00 mm from the mechanical stopper (i.e., from the hard limit). This position is the secondary limit of the X-axis.

Note:

Make a Note of the X-axis co-ordinates displayed on the monitor. This is used as a reference for the X-axis software limit settings.

5. Adjust the position of the secondary limit dog. With the head assembly left at the position of Step 4, slide the position of the secondary limit dog so that the secondary limit sensor just detects it. Find the optimum position while checking the sensor detection LED, or reading the blinking message on the lower left of the operation monitor, see figure 8-9.

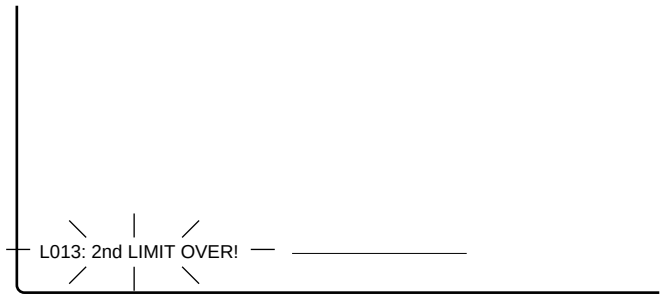


Figure 8-9 "Secondary limit over" display screen

6. Re-tighten the screws of the secondary limit dog.
Use the same procedure from Steps 4 to 6, for the other secondary limit.
After the adjustment is complete, move the head assembly by hand to within the allowable movement range.

8.3.2. Y-axis Secondary Limits

The Y-axis secondary limits are set to approximately 2.00mm inside the mechanical stopper (hard limit). Since this adjustment procedure is exactly the same as for the X-axis, refer to the previous section 8.3.2. The locations of the Y-axis secondary limit dogs are shown below.

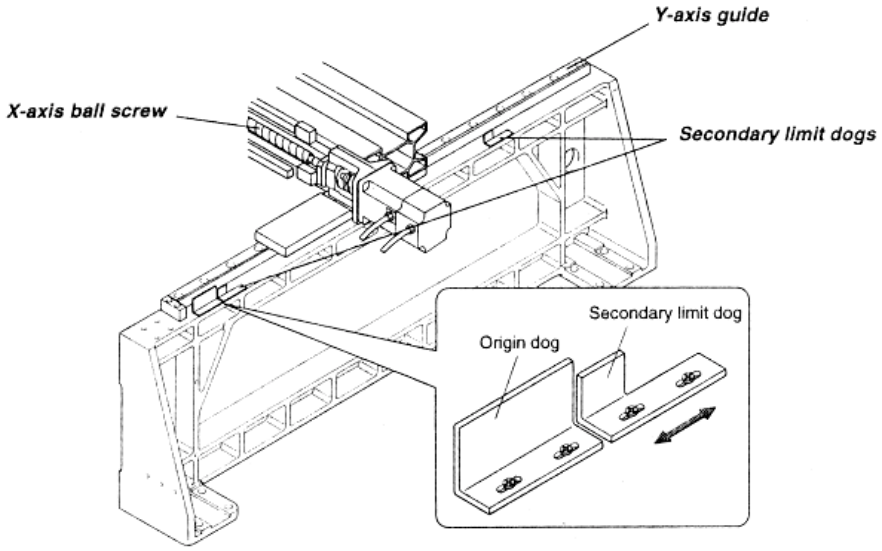


Figure 8-10 Y-axis secondary limit dogs

Note:

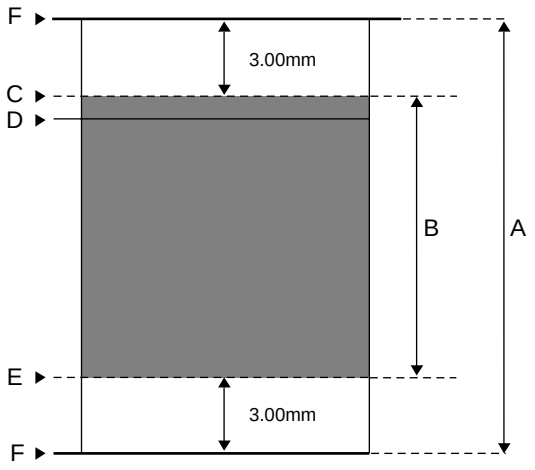
To make settings for the Y-axis secondary limits, use the same procedure as for the X-axis except that you move the head assembly to a point 2.00mm inside the mechanical stopper in Step 5.

8.4. Software Limits

When an axis moves to a target position, the software limit is used to restrict movement to avoid interfering with the mechanical stoppers located at the both ends of the axis. If the target position exceeds the software limit, the error message "... AXIS SOFT LIMIT OVER" appears and axis movement is prohibited. In the Manual mode, you can use the joystick on the HHK within the software limit range.

8.4.1. W-axis Software Limits

The W-axis software limit should be set to 3.00mm inside the mechanical stopper, for both the "plus" side (width enlarging direction) and the "minus" side (width reducing direction).
When the software limit settings are correct, this meets the specifications for the minimum (50.00mm) and maximum (407.00mm) widths of PCBs that can be transferred.



A: Structural movable range
B: Allowable movement range
C: "plus" side software limit (rear)
D: Origin position
E: "minus" side software limit (front)
F: Mechanical limit

Figure 8-11 W-axis movement range

To set the W-axis software limit, follow these steps.

1) Select the W-axis to set the software limit.
Select<<3/MAINTE/M>>>/<<4/MANUAL>>/<A/CHANGECONDITION >/ {A1/SELECT AXES}/"W/MAIN" and press the [ENTER] key.

2) Manipulate the joystick on the HHK to move the W-axis conveyor width. To set the "plus" side software limit, move the axis in the width enlarging direction. To set the "minus" side, move the axis in the width reducing direction.

Note:

Tilting the joystick on the HHK to the right you reduces the width, and tilting it to the left you enlarges the width.
Set the conveyor width to a maximum or minimum as long as the movable rail does not make contact with the mechanical stopper.

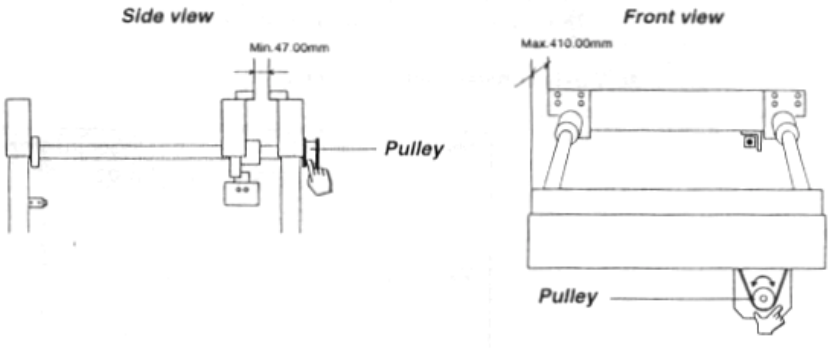
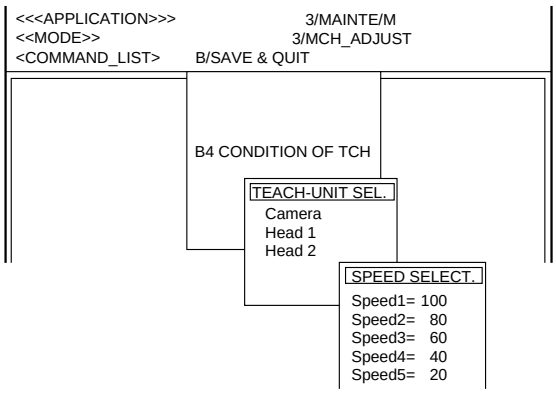


Figure 8-12 W-axis pulley

3) Set teaching conditions as follows;
   1. Select <<<3/MAINTE/M>>>/<<3/MCH_ADJUST>>/<B/SAVE &QUIT>/{B4/CONDITION OF TCH} and press [ENTER].
   2. Select “TEACH-UNIT SEL.” and press the [ENTER] key. Select any of “Camera”, “Head 1” or “Head 2”.
   3. Select “SPEED SELECT.”.Select any speed from 1 to 5.



4) Press the emergency stop button, then move the conveyor rail. Turn the W-axis pulley by hand until the movable rail makes contact with the mechanical stopper. When the movable rail is positioned in contact with the mechanical stopper, the maximum conveyor width is approx. 410.00 mm and the minimum width is approx. 50.00mm. Check the width by measuring with a square or tape measure.

5) Perform teaching at the position in contact with the mechanical stopper
   1. Select <<3/MCH_ADJUST>>/<B/SAVE & QUIT>/{B1/ADJUST TARGET}/”Soft. Limit”and press the [ENTER] key.
   2. Use the arrow keys to line up the cursor with “+direct.” or “-direct.” of the conveyor width being adjusted. The cursor should be positioned on the “direct.” you moved the axis in Step 2.
   3. Press the [F10] key twice to perform teaching. The numerical value of the parameter that the cursor is on changes.

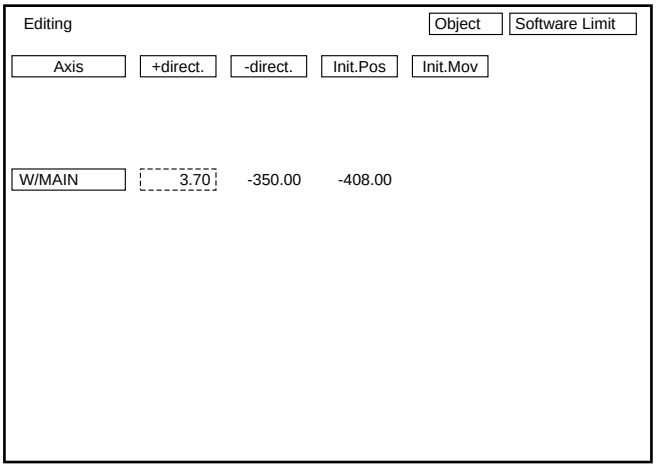


Figure 8-13 W-axis software setting screen

6) Enter the software limit.
Subtract 3.00mm from the mechanical limit on the “plus” side, or add 3.00mm to the mechanical limit on the “minus” side. This value you have just entered is the software limit.

7) Return the conveyor width to within the software limit.
Turn the pulley by hand to return the conveyor width.

8) Cancel emergency stop.
Ensure safety, then release the emergency stop button and press the [READY] button of the HHK.

9) Save the settings.
Press the [ESC] key, then select {B2/SAVE DATA} or {B0/SAVE & QUIT} and press the [ENTER] key.
To quit without saving, select {B3/RECOVER ADJUST} or {B7/QUIT} and press the [ENTER] key.

8.4.2. Z-axis Software Limits

The Z-axis software limit should be set to 1.00mm inside the mechanical stopper, for both the “plus” side (lower direction) and the “minus” side (upper direction).
The “plus” side must be set at a position where nozzle change is not disturbed, and the “minus” side at a position where the nozzles do not interfere with the back-light unit.

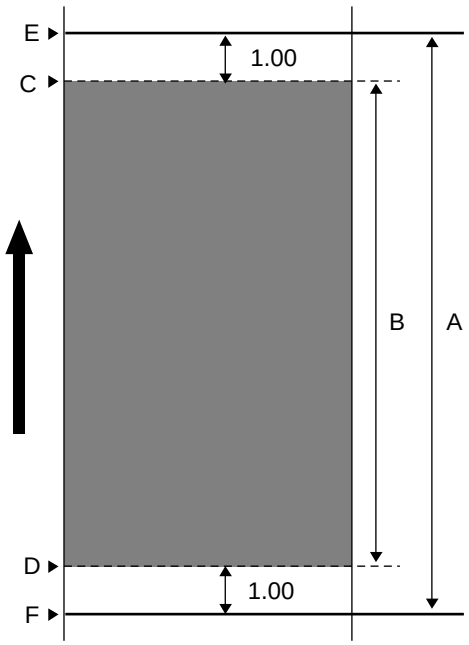


Figure 8-14 Z-axis movement

To set the Z-axis software limit, follow these steps.

1) Set teaching conditions.
   1. Select <<<3/MAINTE/M>>><<3/MCH_ADJUST>><B/SAVE & QUIT>{B4/CONDITION OF TCH} and press the [ENTER] key.
   2. Select “TEACH-UNIT SEL.” and press the [ENTER] key. Select any of “Camera”, “Head 1” or “Head 2”.
   3. Select “SPEED SELECT.”. Select any speed from 1 to 5.

2) Press the emergency stop button, then move the Z-axis.
   Raise or lower the Z-axis by hand until the makes contact with the mechanical stopper. Raise the Z-axis to adjust the “minus” side, while lower it to adjust the “plus” side.

3) Perform teaching at the position in contact with the mechanical stopper.
   1. Select <<3/MCH_ADJUST>>/<B/SAVE & QUIT> /{B1/ADJUST TARGET}/”SoftLimit” and press the [ENTER] key.
   2. Use the arrow keys to line up the cursor with “Z1/MAIN” for the Z1-axis or “Z2/MAIN” for the Z2-axis.The cursor should be positioned on “direct.” you have moved in Step 2.

3. Press the [F10] key twice to perform teaching. The numerical value of the parameter that the cursor is on changes.
This value is the mechanical limit (hard limit).

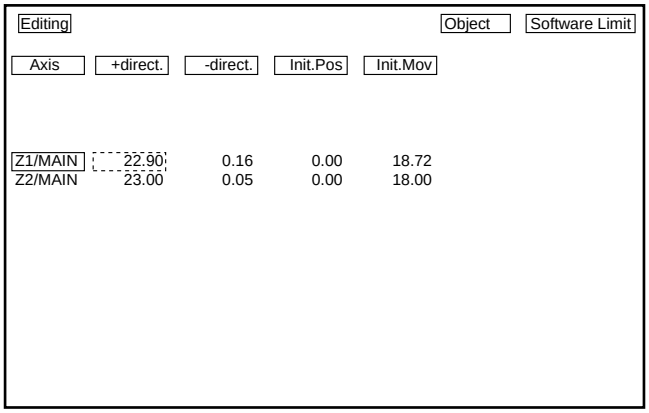


Figure 8-15 Z-axis software setting screen

4) Enter the software limit.
Subtract 1.00mm from the mechanical limit on the “plus” side, or add 1.00mm to the mechanical limit on the “minus” side. This value you have just entered is the software limit.

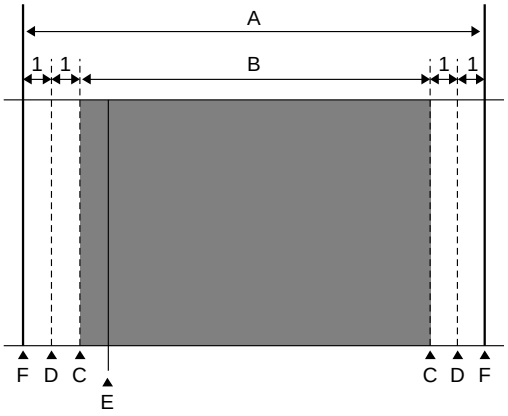
5) Return the Z-axis by hand to within the software limit.

6) Cancel emergency stop. Ensure safety, then release the emergency stop button and press the [READY] button of the HHK.

7) Save the settings. Press the [ESC] key, then select {B2/SAVE DATA} or {B0/SAVE & QUIT} and press the [ENTER] key. To quit without saving, select {B3/RECOVER ADJUST} or {B7/QUIT} and press the [ENTER].

8.4.3. X-axis Software Limits

The X-axis software limit should be set to 1.00mm inside the secondary limit, for both the “plus” side (right direction) and the “minus” side (left direction).



Mechanical stopper
Mechanical stopper
A: Structural movable range
B: Allowable movement range
C: Software limit
D: Secondary limit
E: Origin position
F: Mechanical limit

Figure 8-16 X-axis movement range

Note:

To set the X-axis software limit, use the X-axis secondary limit values you have made a note when adjusting the secondary limits.

1) Open the software limit screen.
   1. Select <<<3/MAINTE/M>>>/<<3/MCH_ADJUST>>/<B/SAVE & QUIT>/ {B1/ADJUST TARGET}/ ”Software Limit” and press the [ENTER] key.
   2. Use the arrow keys to line up the cursor with “+direct.” or “-direct.” in the “X/MAIN” row.

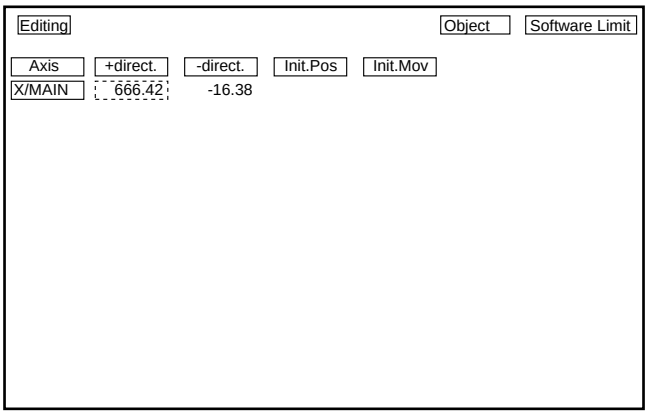


Figure 8-17 X-axis software limit setting screen

2) Enter the software limit.
On the “plus” side enter a value you have subtracted 1.00mm from the secondary limit, or on the “minus” side a value you have added 1.00mm to the secondary limit.

3) Save the settings.
Press the [ESC] key, then select {B2/SAVE DATA} or {B0/SAVE & QUIT} and press the [ENTER] key. To quit without saving, select {B3/RECOVER ADJUST} or {B7/QUIT} and press the [ENTER] key.

8.4.4. Y-axis Software Limits

As with the X-axis, the Y-axis software limit should be set to 1.00mm inside the secondary limit, for both the “plus” side (right direction) and the “minus” side (left direction).

Fig 6360711_003

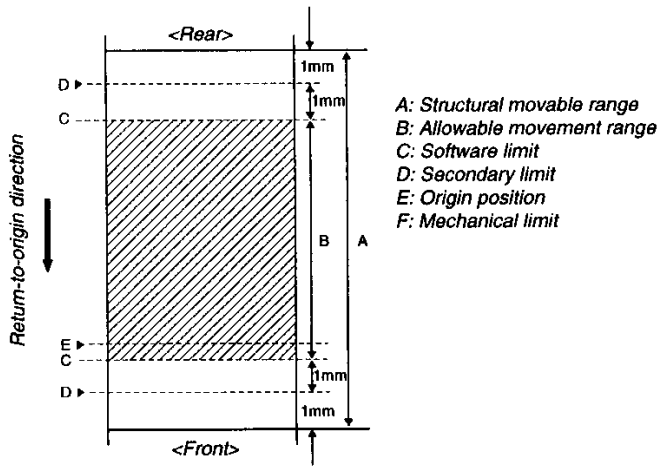


Figure 8-18 Y-axis movement range

Note:

To set the Y-axis software limit, use the Y-axis secondary limit values you have made a note when adjusting the secondary limits.

1) Open the software limit screen.
   1. Select <<<3/MAINTE/M>>>/<<3/MCH_ADJUST>>/<B/SAVE & QUIT>{B1/adjust target}/”Software Limit” and press [ENTER].
   2. Use the arrow keys to line up the cursor with “+direct.” or “-direct.” in the “Y/MAIN” row.

2) Enter the software limit.
On the “plus” side enter a value you have subtracted 1.00mm from the secondary limit, or on the “minus” side a value you have added 1.00mm to the secondary limit.

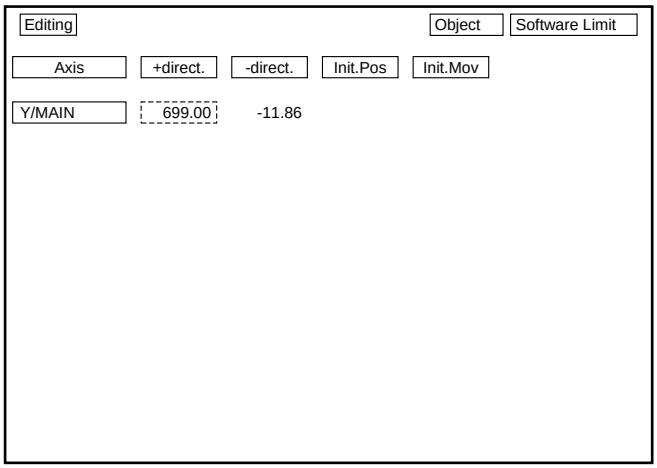


Figure 8-19 Y-axis software limit setting screen

3) Save the settings.
Press the [ESC] key, then select {B2/SAVE DATA} or {B0/SAVE & QUIT} and press the [ENTER] key.
To quit without saving, select {B3/RECOVER ADJUST} or {B7/QUIT} and press the [ENTER] key.

8.4.5. R-axis Software Limits

The R-axis software limit should be set to a fixed value of -360.00 on the “minus” side (clockwise) and to a fixed value of 360.00 on the “plus” side (counter clockwise).

1) Open the software limit screen.
   1. Select <<<3/MAINTE/M>>>/<<3/MCH_ADJUST>>/<B/SAVE & QUIT>/{B1/ADJUST TARGET}/ ”Software Limit” and press the [ENTER] key.
   2. Use the arrow keys to line up the cursor with “+direct.” or “-direct.” in the “R1/MAIN” (or “R2/MAIN) row you want to adjust.
2) Enter the software limit.
   Enter 360.00 for the software limit on the “plus” side, while -360.00 on the “minus” side.

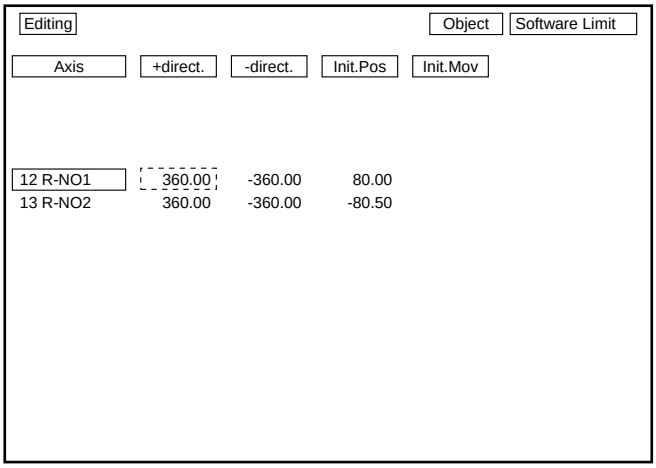


Figure 8-20 R-axis software setting screen

3) Save the settings.
   Press the [ESC] key, then select {B2/SAVE DATA} or {B0/SAVE & QUIT} and press [ENTER] key.
   To quit without saving, select {B3/RECOVER ADJUST} or {B7/QUIT} and press the [ENTER] key.

8.5. Initial Position and Initial Movement

This section explains how to adjust the W-axis and R-axis initial position and Z-axis initial movement.

8.5.1. W-axis Initial Position

The W-axis initial position is the distance between the conveyor rails when the W-axis is in the return-to-origin position, expressed as a minus value.
To set the W-axis initial position, follow these steps.

1) Perform return-to-origin.

2) Press the emergency stop button.

3) Determine the initial position.
   1. Measure the conveyor width W (distance between the fixed and the movable rail).
   2. Subtract 1 mm from this width as a clearance margin and then prefix a “minus” sign to this value. This is the W-axis initial position.

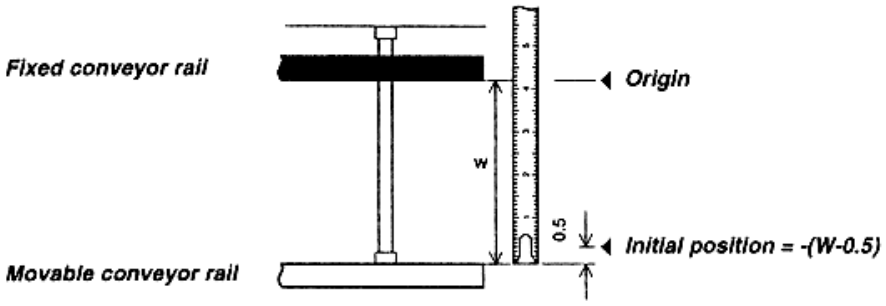


Figure 8-21 Conveyor width measurement and initial position

4) Enter the initial position.
   1. Select <<<3/MAINTE/M>>>/<<3/MCH_ADJUST>>/<B/SAVE & QUIT>/{B1/ADJUST TARGET}/”Soft. Limit” and press the [ENTER]
   2. Use the arrow keys to line up the cursor with “Init. Pos” in the “W/MAIN” row.
   3. Use the numeric keys to enter the initial position value determined in the previous step 3.

5) Cancel the emergency stop.
   Ensure safety, then release the emergency stop button and press the [READY] button of the HHK.

6) Save the settings.
   Press the [ESC] key, then select {B2/SAVE DATA} or {B0/SAVE & QUIT} and press the [ENTER] key. To quit without saving, select {B3/RECOVER ADJUST} or {B7/QUIT} and press the [ENTER] key.

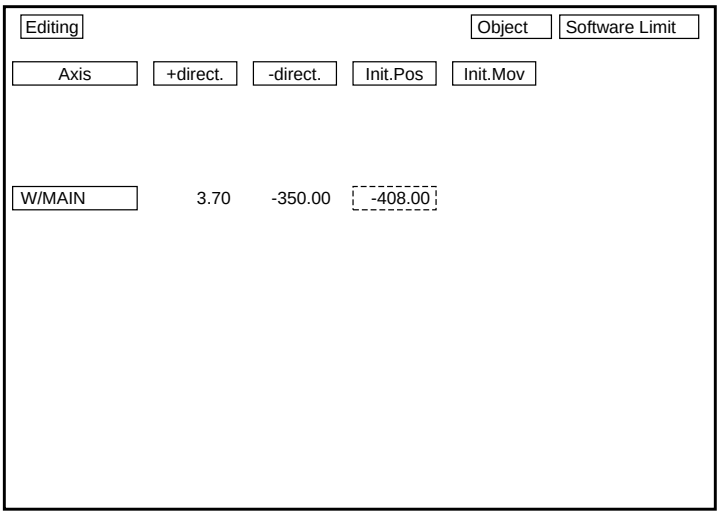


Figure 8-22 W-axis initial position setting screen

8.5.2. Adjusting the R-axis Initial Position

Nozzles such as Type 32 have an orientation. Since components are usually picked at 0 degree, the R-axis initial position must be adjusted so that these nozzles are aligned with the direction of components (the nozzle holder's leaf springs are set parallel with the X-axis).

1) Execute the “CHANGE NOZZLE” command to attach a nozzle (for example Type 32) to a head.
2) Press the emergency stop button.
3) Check that the nozzle holder's leaf springs are set parallel with the X-axis). If not parallel with the X-axis, adjust by rotating the nozzle shaft. (Moving the R-axis belt by hand allows easy adjustment.)
4) Set teaching conditions
    1. Press the emergency button.
    2. Attach a 31 type nozzle to head1.
    3. Check that the nozzle holder’s leaf springs are set parallel with the X-axis, if not rotate the R-axis until they do.
    4. Set teaching conditions by selecting <3/3/B4> and press ENTER.
    5. Perform teaching for the R-axis initial position. Select <3/3/B1> “Softlimit” and press ENTER. Use the arrow keys to line up the cursor with the “init.pos.” of the “R/main” row and press F10 twice to perform teaching.
    6. Save the settings.
    Press the [ESC] key, select {B2/SAVE DATA} or {B0/SAVE & QUIT} and press the [ENTER] key. To quit without saving, select {B3/RECOVER ADJUST} or {B7/QUIT} and press the [ENTER] key.

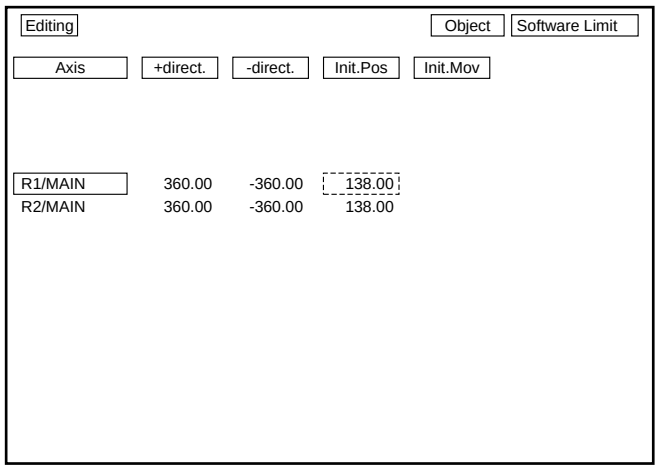


Figure 8-23 R-axis initial position setting screen

8.5.3. Z-axis Initial Movement

The Z-axis initial movement setting is the height at which the nozzle tip makes contact with the surface of a PCB placed on the conveyor. You will need a PCB to make this setting.

1) Check that a nozzle is attached to Head 1.
   Any type of nozzle can be used for this setting.

2) Adjust the conveyor width according to the PCB.
   To adjust the conveyor width, you can use the Conveyor Unit utility in the Data Manager. (If your machine is not equipped with an auto conveyor width adjusting function, adjust manually.)

3) Press the emergency stop button, then set the PCB.
   Also adjust the locate pins and push-up pins according to the PCB.
   To secure the PCB in position, it is convenient to use the Conveyor Unit utility in Step 2.

4) Move the head assembly to around the centre of the PCB.
   Lower the nozzle by hand.
   Lower the nozzle until the nozzle tip just makes contact with the surface of the PCB.

5) Set teaching conditions.
   1. Select <3/3/B4/ CONDITION OF TCH> and press the [ENTER]
   2. Select the teaching unit “Head 1 “ and press the [ENTER] key.
   3. Select any speed from 1 to 5 and press the [ENTER]

6) Perform teaching for the Z-axis initial movement.
   1. Select <3/B/SAVE & QUIT>/B1/"Soft. Limit" and press [ENTER]. Use the arrow keys to line up the cursor with "Init. Mov." in the "Z1/MAIN" row.
   2. Press the [F10] key twice to perform teaching. The numerical value of the parameter that the cursor is on changes.

7) Next, enter the initial movement for Head 2 (Z2-axis).
   Enter the same value as for Head 1, for "Init. Mov." in the "Z2/MAIN" row.

8) Cancel emergency stop.
   Ensure safety, then release the emergency stop button and press the [READY] button of the HHK.

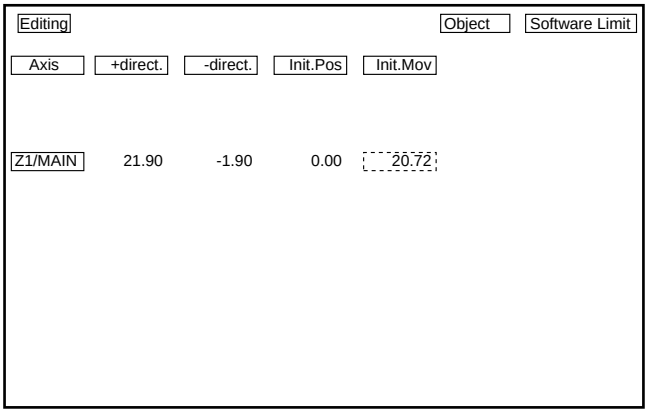


Figure 8-24 Software setting screen (for initial movement)

9) Save the settings.
   Press the [ESC] key, then select {B2/SAVE DATA} or {B0/SAVE & QUIT} and press [ENTER] key. To quit without saving, select {B3/RECOVER ADJUST} or {B7/QUIT} and press the [ENTER] key.

8.6. Axes Assembly, Disassembly, Adjustments and Maintenance

This section describes the assembly, disassembly and adjustments of the various axes systems in the Topaz.

WARNING

MAKE SURE TO TAKE ALL THE NECESSARY SAFETY PRECAUTIONS WHEN DOING MECHANICAL ACTIONS AT THE SYSTEM. ALWAYS SWITCH OFF THE MACHINE IF MECHANICAL ASSEMBLY OR DISASSEMBLY ACTIONS ARE CARRIED OUT.

8.6.1. Adjustment of the X- and Y-motor Encoder Position

Action before changing the X- or Y-axis or X- or Y-motor:

1. Perform init. servo origin.
2. For reference point use a mark seal (sticker) with an accurate sign (cross hair, corner, etc.). Put it on the middle of the front conveyor rail.
3. Perform teaching of a dedicated point with the moving camera. Switch on Head light 1: TE09.
4. Note the X and Y positions, e.g. X= 424.29 Y=177.43

Action after changing the X- or Y-axis or X- or Y-motor:

1. Perform init. servo origin.
2. Switch on the light of the moving camera; TE09 in <3/4/C/display&exit/C1> output monitor.
3. Point move to the above noted positions. **Press the EMG switch.**
4. Loosen the screws on the X/Y-motor coupling.
5. Push the "Ready" key on the HHK, while still at the above X and Y positions. This will block the positions of the X/Y-motor(encoder).
6. Move the head assembly to the exact correct positions by hand (look at the vision monitor).
7. Re-tighten the screws on the motor coupling.
8. Point move to the noted positions again just to be sure.
9. Perform init. servo origin.
10. Check for 50% values and readjust if necessary.

8.6.2. Head Replacement

Disassemble the head as described below (see figure 13.5.3).

1. Make sure to know the status of the system in advance of this replacement.
2. Switch off the system.
3. Cut loss al the tie-wraps binding the cables and hoses to the head unit.
4. Remove the two orange air hoses.
5. Remove all cabling connecting the head assembly to the X-beam. Following cables are to be removed from connector plate item 33 in figure 13.6-1;
   - Vacuum sensor harness
   - R-motor and encoder cable.
   - All cables as head-blow off, -vacuum, -down, -slow down, -down sensor.
   - Earth cable and fiducial camera cables as well as the overall head down sensor cabling.
6. Remove the complete head assy by removing the bolts item 216 in figure 13.5-3. The head is attached to plate item 13 in figure 13.6-1 by means of fitting pins.
7. Assembling is done in reverse order.

8.6.3. X-axis Assembly

The mechanical assembly of the X-axis is shown in figure 13.6-1.

8.6.3.1. X-axis: Replacement X-motor Only

The X-axis motor is a 750W AC-Servo motor. Removing the motor is done as described below. See for reference figure 13.6-1.

1. Determine the X and Y positions by performing the first part of the adjustment procedure of the X-motor encoder position before removing the X-motor. See section 8.6.1.
2. Switch off the system.
3. Disconnect the PI and MO cable in the cable duct (right side of system).
4. Loosen the coupling (4) from the motor shaft.
5. Remove the four bolts which hold the X-motor to the bracket (10).
6. Remove the AC-Motor (15).
7. Re-assemble in reverse order.
8. Switch on the machine to perform the second part of the adjustment procedure of the X-motor encoder position after replacing the X-motor. See section 8.6.1.

8.6.3.2. X-axis: Ball Screw Replacement

Replacing the X-axis ball screw is done as described below. See for reference figure 8-25.

Do **NOT** remove the X-motor.

1. Determine the X and Y positions by performing the first part of the adjustment procedure of the X-motor encoder position before removing the X-axis ball screw. See section 8.6.1.
2. Switch off the machine: Quit the VIOS software operation and turn off the main switch of the machine.
3. Remove the head assembly as described in section 8.6.2.
4. Remove the two green bolts of the green coupling (4).

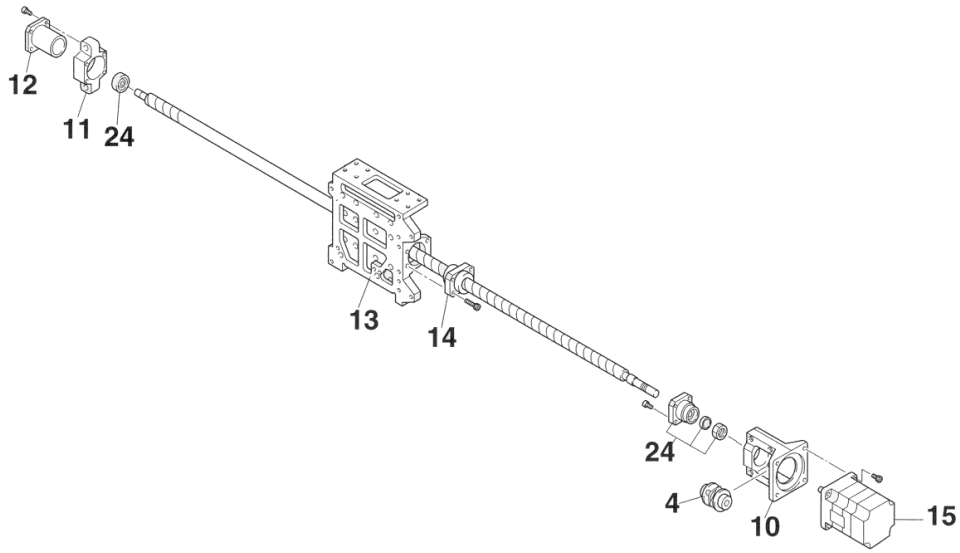


Figure 8-25 X-axis ball screw

5. Remove the four bolts (firmly tightened) of the support unit (24) at the right hand side.
6. Do **NOT** remove the holders 10, 11 and 12.
7. Remove the four bolts that secure the ball screw nut holder (14) to the head holder unit (13). Move the head holder unit to the left and the ball screw nut holder (14) to the right.
8. Gently move the ball screw to the left to free the support unit (24) from the X-motor holder (10).
9. Remove the circlip and the bearing of the support unit (24) on the left side.
10. Now gently take out the complete ball screw assembly.
11. Do **NOT** remove the items 10, 11, 12 and 13.

12. Re-install the new X-axis ball screw:
    - Install the ball screw with the right hand mounted support unit.
    - Assemble the bearing and the circlip of the left hand support unit.
    - Install the support unit (24) into the X-motor holder (10) and tighten the four bolts at 7.4 Nm by using a torque wrench.
    - Position the head holder unit (13) to the right of the X-axis and install the two left screws of the ball screw nut holder (14).
    - Position the head holder unit (13) to the centre of the X-axis and install the two right screws of the ball screw nut holder (14).
    - Tighten all four screws at 7.4 Nm by using a torque wrench.
13. Switch on the machine to perform the second part of the adjustment procedure of the X-motor encoder position after replacing the X-axis ball screw. See section 8.6.1.

8.6.3.3. X-axis: Linear Guide Replacement

Replacing the X-axis linear guides is done as described below. See for reference figure 13.6-1.

1. Remove the head assembly as described in section 8.6.2.
2. From the guide that must be replaced, disconnect the guide bearings from the head holder unit (13) by removing the bolts.
3. Remove the guide from the X-axis beam by removing the bolts holding the guide.
4. Replace the guide and assemble in reverse order. During assembling, the distance between the two guides is fixed to 70mm. The bottom and top linear guide are parallel to each other with no tolerance.

8.6.4. Y-axis Assembly

The mechanical assembly of the Y-axis is shown in figure 13.6-2.

8.6.4.1. Y-axis: Replacement Y-motor Only

The Y-axis motor is a 400W AC-Servo motor. Removing the motor is done as described below. See for reference figure 13.6-2.

1. Determine the X and Y positions by performing the first part of the adjustment procedure of the Y-motor encoder position before removing the Y-motor. See section 8.6.1.
2. Disconnect the PI and MO cable in the cable duct (right side of system).
3. Loosen the coupling on the motor shaft.
4. Remove the four bolts which holding the Y-motor.
5. Remove the AC-Motor.
6. Assemble in reverse order.
7. Switch on the machine to perform the second part of the adjustment procedure of the Y-motor encoder position after replacing the Y-motor. See section 8.6.1.

8.6.4.2. Y-axis: Removing Y-axis Ball Screw Generation 2

Removing a 2nd generation Y-axis ball screw is done as described below. See for reference figure 8-26.

Do **NOT** remove the Y-motor.

1. Determine the X and Y positions by performing the first part of the adjustment procedure of the Y-motor encoder position before removing the Y-axis ball screw. See section 8.6.1.
2. Switch off the machine: Quit the VIOS software operation and turn off the main switch of the machine.
3. Remove the support unit bearing (4C) in the back of the machine:
   - Remove the cover (33) and the lock nut (27), watch for the "copper chip" which is under the set screw.
   - Remove the three spring coned disks (35).
   - Remove the sleeve bearing (32) and the thrust bearing (36).
   - Remove the four hexagon bolts (30) and the bearing holder (34).
   - Remove the circlip and the support unit bearing (4C).
   - **Do NOT remove the Y-axis bearing holder (6).**

   The ball screw (3) is now free on one side.

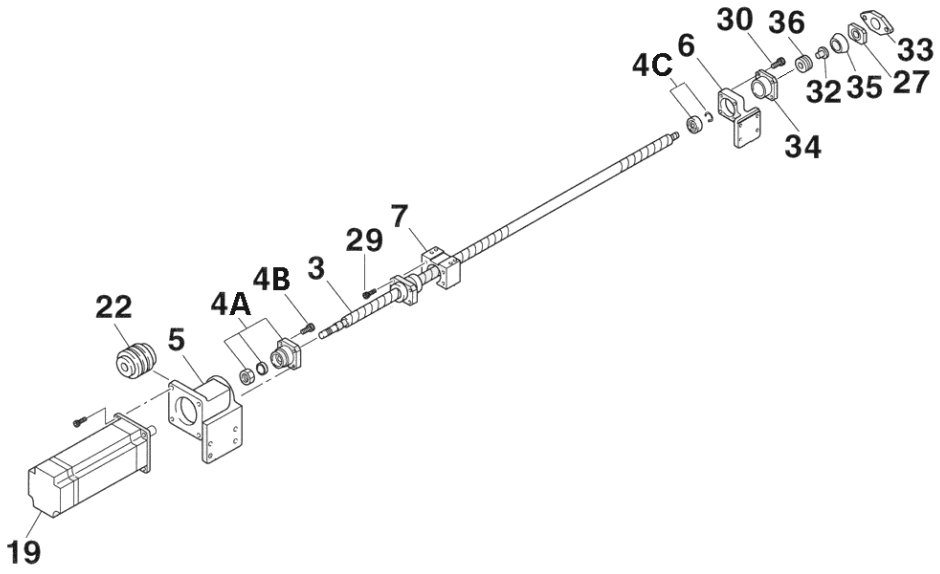


Figure 8-26 Y-axis ball screw generation 2

4. Remove the ball screw:
   - Move the robot arm backwards near the Y-axis bearing holder (6).
   - Remove the two hexagon bolts of the green coupling (22).
   - Remove the four hexagon bolts (4B) that secure the support unit (4A).
   - **Do NOT remove the Y-axis motor holder (5).**
   - Remove the four hexagon bolts (29) from the ball screw which are mounted in the Y-axis nut holder (7).
   - Now gently take out the complete ball screw.
   - Remove the lock nut and support unit (4A).
5. Continue with installing and aligning the new Y-axis ball screw generation 3, see section 8.6.4.4.

8.6.4.3. Y-axis: Removing Y-axis Ball Screw Generation 3

Removing a 3rd generation Y-axis ball screw is done as is described below. See for reference figure 8-27.

Do **NOT** remove the Y-motor.

1. Determine the X and Y positions by performing the first part of the adjustment procedure of the Y-motor encoder position before removing the Y-axis ball screw. See section 8.6.1.
2. Switch off the machine: Quit the VIOS software operation and turn off the main switch of the machine.
3. Remove the support unit bearing (4C) in the back of the machine:
   - Remove the lock nut (27), watch for the "copper chip" which is under the set screw.
   - Remove the three spring coned disks (26).
   - Remove the thrust bearing (25).
   - Remove the four hexagon bolts (30) and the bearing holder (20).
   - Remove the circlip and the support unit bearing (4C).
   - **Do NOT remove the Y-axis bearing holder (6).**

   The ball screw (3) is now free on one side.

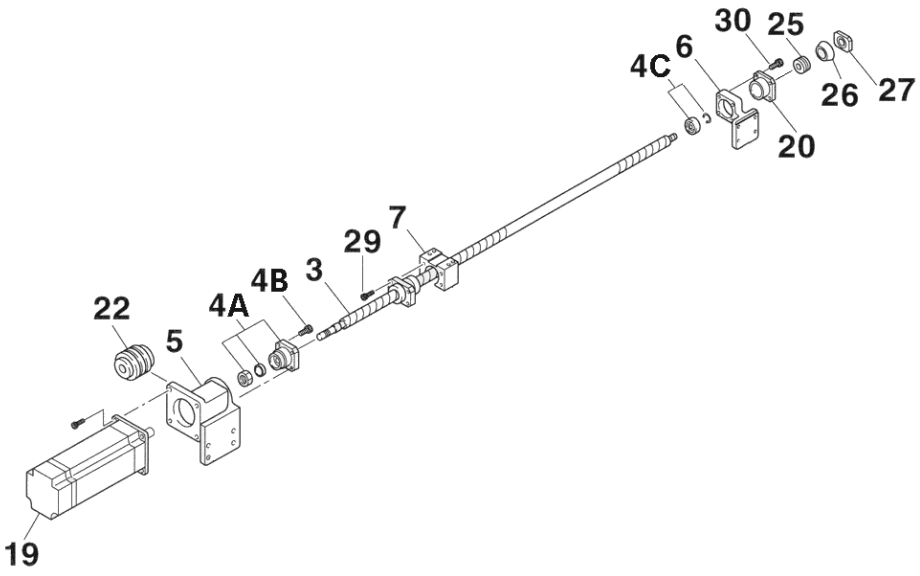


Figure 8-27 Y-axis ball screw generation 3

4. Remove the ball screw:
   - Move the robot arm backwards near the Y-axis bearing holder (6).
   - Remove the two hexagon bolts of the green coupling (22).
   - Remove the four hexagon bolts (4B) that secure the support unit (4A).
   - **Do NOT remove the Y-axis motor holder (5).**
   - Remove the four hexagon bolts (29) from the ball screw which are mounted in the Y-axis nut holder (7).
   - Now gently take out the complete ball screw.
   - Remove the lock nut and support unit (4A).
5. Continue with installing and aligning the new Y-axis ball screw generation 3, see section 8.6.4.4.

8.6.4.4. Y-axis: Installing and Aligning Y-axis Ball Screw Generation 3

For replacing a 3rd generation Y-axis ball screw a replacement kit is available. When a 2nd generation Y-axis ball screw is replaced for a 3rd generation Y-axis ball screw, ordering a grease nipple in addition to the replacement kit is recommended.
See for reference figures 8-27 and 8-28.

1. Check the parts of the replacement kit (5322 310 11287), listed in table 8-3.

Item	Figure	Service number (12NC)	Description	Qty
Complete replacement kit:				
3	8-27	5322 816 11327	Ball screw	1
4A/B/C	8-27	5322 520 40305	Support unit	1
20	8-27/28	5322 816 11298	Bearing holder	1
25	8-27/28	5322 816 11296	Thrust bearing	1
26	8-27/28	5322 816 11297	Spring coned disk	3
27	8-27/28	5322 816 11292	Lock nut	1
31	8-28	5322 526 10729	Grease nipple	2

Table 8-3 Y-axis ball screw replacement kit

2. Place the new (generation 3) ball screw:
   - Assemble the support unit (4A) and the support unit bearing and circlip (4C) on the ball screw.
   - Now carefully place the ball screw.
   - Assemble the new bearing holder (20) but do not fully tighten the bolts (30).
   - Tighten the four bolts (4B) at the front support unit (4A) with a torque of 3-8 Nm.
   - Assemble the new thrust bearing (25), but grease first(NSK1).
   - Assemble the spring coned disks (26) and lock nut (27), so that the spring coned disks just touch each other only. Mind the assemble direction of the disks, see figure 8-28.
   - **Note:** check at the ball screw nut holder bearing nipple if it properly has been greased.

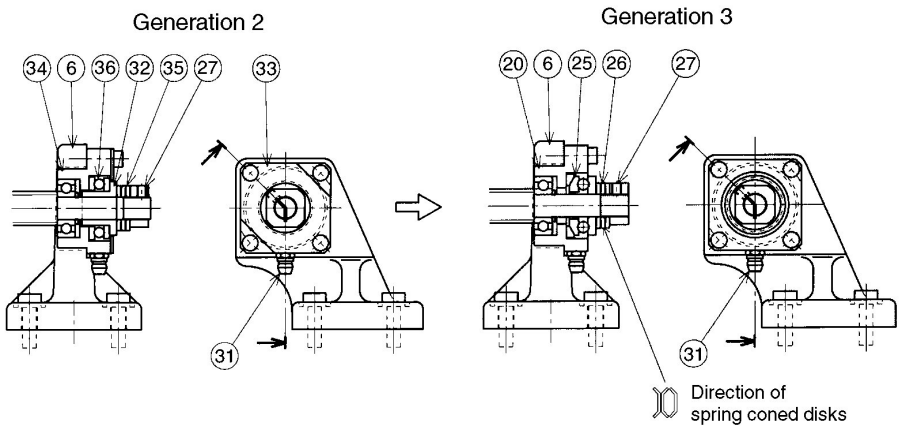


Figure 8-28 Replacement of generation 2 ball screw for generation 3 ball screw

Difference generation 2 and generation 3.
The difference between the 2nd and 3rd generation ball screw assembly is found in the Bearing holder (34), Sleeve bearing (32) and thrust bearing(36). In the 3rd generation these have been changed for a new Bearing holder (20) and new Thrust bearing (25) only. See figure 8-28.

3. Alignment of the Y-axis ball screw:
   - Use the alignment tool(4022 591 74241), see fig. 8-29, and put it carfully on the linear guide, first at the front of the machine, 30mm from the motor. Secondly at the back, 30mm from the Y-axis bearing holder (6). Make sure both the tips of the dial gauges are not in a valley of the ball screw.
   - For horizontal alignment check the distance between the linear guide and the ball screw at the front and at the back; max 0.02mm difference between front and back.
   - For vertical alignment of the ball screw the difference is also max. 0.02mm between front and back.
   - Adjust both alignments by shifting the bearing holder (20). Then tighten its four bolts with a torque of 6-7 Nm.

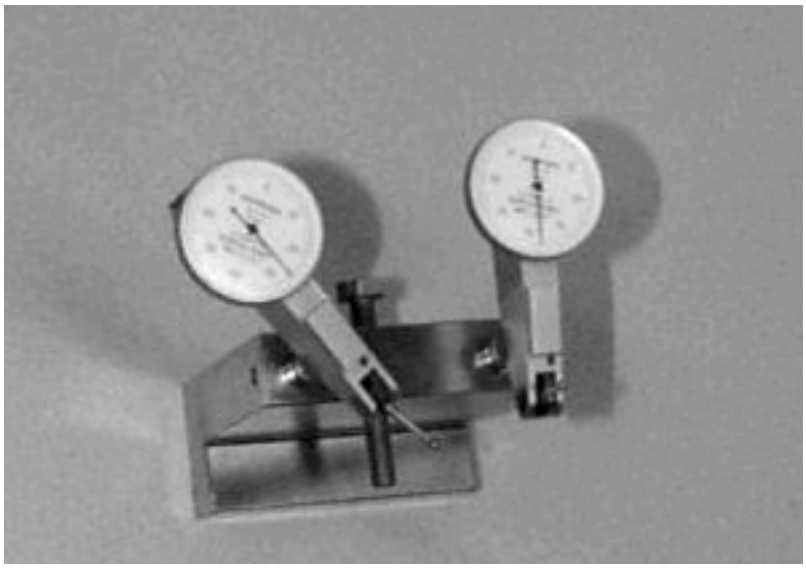


Figure 8-29 alignment tool of the Y-axis ball screw

4. Assemble the Y-axis ball screw to the Y-axis nut holder (7):
   - Position the robot-arm at the front of the machine.
   - Assemble the two left bolts of the nut holder finger-tight.
   - Position the robot-arm at the middle position of the Y-axis.
   - Assemble the two right bolts finger-tight.
   - Tighten all 4 bolts at a torque of 7.4 Nm, using a torque wrench.
   - Tighten the 2 green bolts at the coupling (22)
5. Switch on the machine to perform the second part of the adjustment procedure of the Y-motor encoder position after replacing the Y-axis ball screw. See section 8.6.1. Switch the machine off again after executing this procedure.
6. Tighten the two green bolts at the coupling (22).

8.6.4.5. Y-axis: Pre-tension Adjustment (Generation 3 Y-axis)

The Y-axis ball screw has three spring coned disks, which control the tension of the Y-axis movement. See for reference figure 8-28.

1. Make sure the surface of the guides and ball screw is free of dirt and overdue grease.
2. Make sure the spring coned disks are tightened so they just touch each other only.
3. Apply one short turn (45 degrees) to the lock nut (Fig. 8-27, 27) by hand only, see figure 8-30.

Figure 8-30 Adjusting the pre-tension

4. Move the Y-axis by use of any utility program.
5. Only tighten the lock nut slightly more if the axis makes noise (press EMG switch first).
6. Max. pre-tension adjustment is less than 90 degrees turn.
7. Tighten the set screw (watch for the copper chip) of the lock nut, see figure 8-31.

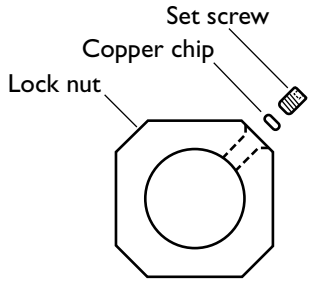


Figure 8-31 Lock nut set

8. Check if all bolts of the Y-axis are tightened well.

8.6.4.6. Y-axis: Linear Guide Replacement

For replacing the Y-axis linear guides, please refer to figure 13.6-2.

Remark: For the Topaz the left (driven-side) linear guide is different from the right (drive-side) linear guide. (See spare parts list).

Right linear guide (drive side):
When the right linear guide must be replaced it is recommended to remove the whole X-axis beam. After the X-axis beam is removed, adjusting the linear guides is done as follows:

1. Remove the plate above item (17).
2. Remove the right linear guide (23) by loosen the bolts holding the guide.
3. Replace the old guide by new one.
4. The distance between the nut holder (item 8) and the centre of the bearings is defined by plate 2 in the X-axis system (see fig. 13.6-1.). This distance is 50mm.
5. Set plate 2 on the nut holder (item 8) and fix it to the rear bearing. Move the plate to the rear of the system. Fix the guide at the rear.
6. Fix plate 2 to the front bearing and move plate 2 to the front of the system. If the distance is set to 50mm, then fix the rear of the linear bearing.
7. Remove plate 2. Set a dial gauge to nut holder (item 8) and set the parallelity of the linear guide to the ball screw. The NON-linearity should not exceed 0.05mm per 595mm. Re-assemble in reverse order.

Left linear guide (driven side):
The left linear guide can only be replaced if the X-axis is disconnected from both bearings (especially the rear).

1. Remove the left linear guide by removing the bolt and replace the guide
2. Fix the X-axis beam to the bearings of the guide.
3. Move by hand (at the motor side) the X-axis beam to the rear of the system
4. Fix the rear screw of the guide.
5. Slowly move the X-axis beam by hand to the front, move only at the motor side. Every time a bolt can be fixed, then slowly fix the guide bolt by bolt.
6. For the front bolts; If the X-axis is moved all the way to the front, then slowly move it to the back while attaching one by one the bolts of the linear guide.

8.6.5. Z-axis Assembly

The mechanical assembly of the Z-axis is detailed in figure 13.5-3.

Z-axis: Z-Motor replacement

Replace the Z-motor by proceding as follows:

1) Remove the head assembly as described in the beginning of this section, this is not absolutely necessary but easy. If the head is not removed make sure to disconnect the motor and encoder cable from connector plate item 33 in figure 13.6-1.
2) Remove the motor by loosening the four screws item 218 holding it to bracket 29.
3) Assemble in reverse order.

Z-axis: Z-bearing replacement

To replace the Z-bearings proceed as follows:

1) Remove the head assembly as described in the beginning of this section.
2) Remove the moving part of the head assy from plate item 2 by means of removing the bolts item 216.
3) Remove the ball slides item 36 in figure 13.5-2 by removing the bolts item 217 in figure 13.5-2.
4) Replace the ball slides by assembling in the reverse order. The position of the ballslides in vertical direction is secured by the shape of frame item 1 in figure 13.5-2. The horizontal direction on this frame is determined by means of fitting pins. The horizontal position of the whole unit on plate item 2 in figure 13.5-3 is also determined by means of fitting pins. The vertical position on plate item 2 may shift a little as much as the holes allow.

8.6.6. R-axis Assembly

The mechanical assembly of the R-Axes of the Topaz is shown in figure 13.5-2. The Topaz uses a belt drive while the encoder a part is of the R-motor assembly.

R-Axis: Replacing the Nozzle Holder

1) Remove the leaf springs item 103 by means of screw 104, take care not to loose the washer item 105.
2) Remove the pin item 2' in figure 13.5-2a. The pin has to be driven out of the hole before replacing the nozzle holder is possible. The best way to do this to make sure the spline is supported at the rear side and by using a small pin to drive the pin out of the shaft.
3) Reassemble the new nozzle holder and leaf springs in the reverse way.
Check the leaf springs if they can hold the nozzle well, if not replace the springs.

R-axis: Replacing the Spline Shaft

Replacement of the spline shaft is done as follows:

1) Remove the head assembly from the machine as described in the previous section.
2) Loosen belt item 38 and remove the bolts 206. Remove items 62, 31, 12 and loosen circlip 234. The spline shaft can now be removed.
3) Reasssemble in the reverse order.

R-axis: Replacing and Maintaining the Piston and Plugs Assy's

This part describes how to replace parts of the piston and plugs assy's as well as what has to be done to maintain them.

The piston assy of head 1 is different from heads 2 to 8 but the maintenance actions are similar for both. Disassembling is done as follows:

1) Disassembling the piston assy is done by removing the plug assy item 3.
2) All assy's item 2, 26 or 6 and 10 are now accessible.
3) Item 2 can be disassembled into the parts 3,4 and 5. When this assy is reassembled proceed as follows:
   - Apply molykote 6189 grease to packing item 4.
   - Insert the special stopper tool (5322 395 10712) from the top into item 3.
   - Insert packing 4 into item 3 from the bottom while taking care of the correct direction !
   - Set packing item 4 into position by using the special pusher pin (5322 395 10712)
4) The piston assy for head 1 can be disassembled into the parts 27, 28, 29, 9, 235, 8 and 9 staring by removing the set screw item 27. When this assy is reassembled proceed as follows;
   - Apply molykote 6189 grease to packings item 8 and 9.
   - Set packing item 9 into place using a small screw driver while taking care of the direction of the packing.
   - Insert packing item 8 into by using the special rocket tool (5322 395 10713)
   - Insert packing item 9 on the same side as packing 8.
   - Mount the whole assembly into place and close the assembly by means of screw item 27.
5) The piston assy of the other heads is handled in the same way as for head 1 with the exception that the items 27, 28 and 29 are not present.
6) The plug 2 assy, the bottom part, can be disassembled into item 5, 11, 4 and again 5. When assembling this part take care the packing item 4 is greased with molykote 6189 and the direction of the packing is the same as when it was disassembled.

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CHAPTER 9 Vision Systems

9.1. Introduction

This chapter describes the vision systems that are used in the Topaz.

9.2. Vision Systems

The standard model of Topaz uses following camera recognition equipment:

- A moving camera to recognise the PCB fiducial marks to be able to correct for any shifts in the PCB layout.
- One (in the front) or two (second at the back) linear sensor camera systems also referred to as multi-camera. This camera is used to recognise components as chips etc. The camera uses a one line CCD to read one line of the picture at a time, the picture of the component is build by flying over the camera with a specified speed and storing line by line in memory.
- One CCD camera also referred to as the single-vision camera to recognise component as QFP etc.

This section describes how to adjust the vision system. All adjustment items can be adjusted with the utilities in the Machine Adjust mode of the maintenance Manager.

Be aware that the second multi camera, which is an option, reduces the maximum PCB width from 407mm to 305mm !

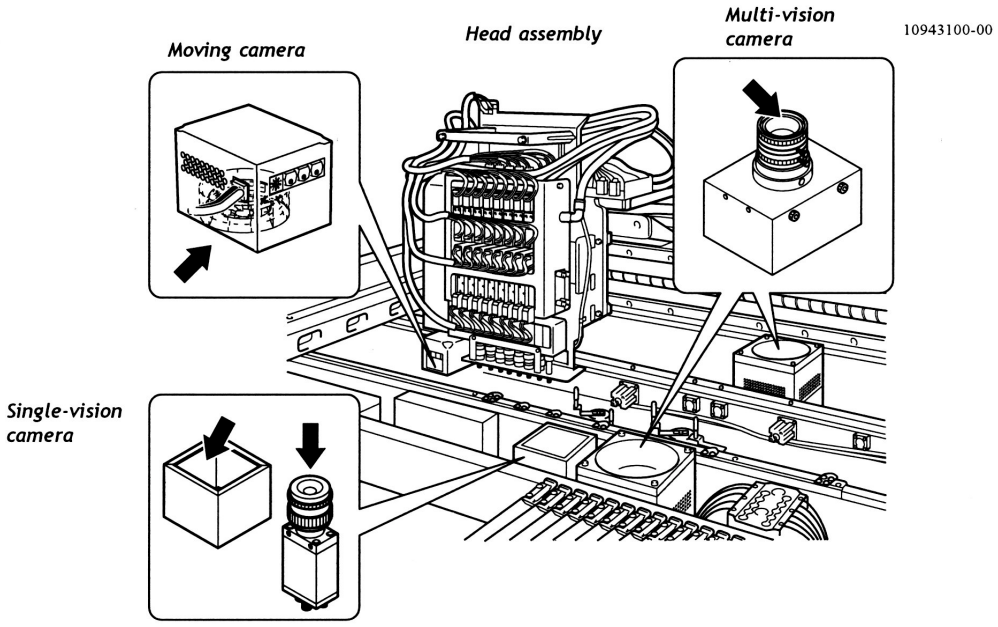


Figure 9-1 Vision Systems of the Topaz

9.2.1. Pre-Start Operations

Prior to the camera adjustments, especially the single- and multi-camera adjustments, it is wise to perform one or more of the following pre-start operations:

- If a FES is installed to front of the system remove the FES carriage to enable easy access to the multi- and if installed also the single vision camera.
  If a FES is installed at the backside of the system remove the FES carriage if an optional second multi-camera is installed.

- If NO FES is installed at the front of the system, remove the tape waste guide of the front feederbar to enable easier access to the camera's at the front.
  If the optional second multi-camera is installed at the back of the system than remove the tape waste guide also from the rear feederbar.

9.3. Moving Camera

The moving camera is located in the head assembly and used to recognise PCB fiducial marks and perform teaching. The lighting level and the scale of the moving camera can be adjusted.

9.3.1. Adjusting the Focus and Field Of View

Focusing the moving camera is a fairly simple process. While looking at something on the PCB that provides good contrast, simply move the camera up or down as necessary to obtain the sharpest picture. One thing to keep in mind while moving the camera is to keep it straight, has a direct impact on the scale procedure.

NOTE:

You may use a fiducial for focus, however, any thing on the board that provides good contrast and detail will work (i.e. any writing or etchings on the board).

Synopsis:
Fix a board in place that has a good clear fiducial. Go to the database and perform an F6 function. Use the "Teach Mark" section to move the camera over the fiducial and then move the camera up or down as necessary to obtain the sharpest picture. Don't forget to keep the camera straight.

Adjusting the focus:

1. Set up the transport section to receive the PCB to be used for this section (use a PCB that has a reflective fiducial, don't use the glass plate). This is the same as a product change over with out the feeders.
2. Go to the Database 2/DATA/M→3/DATABASE→MARK D.B.
3. Move the cursor to any line containing a fiducial and press F6 (you won't actually use the whole F6 function).

4. The cursor will be on the "FIX PCB" line. Press Enter. If the board is already fixed in position, move the cursor to "RETURN" and press Enter. If the board is not in place, fix it in place at this time then go to "RETURN" and press Enter.
5. Move the cursor to "TEACH MARK" and press Enter.
6. Use the joystick to move the camera over the fiducial or object to be used to set the focus.
7. To adjust the focus:
   a. Remove the plastic cover on the head assembly.
   b. Loosen the two screws that allow movement of the camera up and down.
   c. Move the camera up or down as necessary to obtain the sharpest picture while keeping the camera straight.
   d. Retighten the screws and replace the plastic cover when the image is in focus.

Adjusting the Field Of View:

1. Insert a PCB and clamp it manually (e.g. with use of the DO-screen).
2. Put a plastic ruler onto the PCB surface in such a way that the ruler appears vertical onto the vision screen.
3. Check the Field Of View, it is 4.8mm average.
4. If the Field Of View is way out than the camera should be move up and down until the FOV is within acceptable range. Note that the FOV is not very critical, 5mm as well as 4.6 is also acceptable.
5. If the FOV is changed the focus should be checked again, find the optimum of the two.

9.3.2. Adjusting the Lighting Level of the Moving Camera

For accurate recognition of PCB fiducial marks, the lighting level of the moving camera must be optimised. To make the adjustment, an optional custom tool (light adjuster plate: 5322 395 10274) should be used.

NOTE:

If fiducial lighting unit has 1 dial and three potentiometers, and you have a light adjuster tool (part number 5322 395 10274) you should use the special tool option in Moving Camera Light. This will take you through adjusting the individual light of the moving camera. Inner Light, Outer Light, and Coaxial, with each dial position being set for each position.
Ensure to reset the Dial position to 0 so all light types will be available to the machine. When using the light adjuster tool, ensure that the lighter side of the tool is in full view of the camera when setting the lighting level.

This automated procedure checks the brightness of the LED lights for the moving camera. To do this you will need to fix a board in position that has a clean fiducial. It is preferred to use a circle of at least 1.0mm.

There is a direct relationship between the *Threshold* value of the mark and the level of light the machine will accept as "OK". Before performing this procedure it is recommended to go to the database where this mark resides and find out what the Threshold value is (see section 11.3.9 A →1, 2, 3 for directions how to get there). Once in the database, press the F4 key until the "Vision Info" sub-window is displayed. In this sub-window is the Threshold value. The lighting level needed to produce an "Average Gray Level that is "OK" is very close to this level.

1. Prepare the light adjuster plate.

Prepare the light adjuster plate and a proper PCB on which the light adjuster can be placed. PCB fiducial marks are not necessary.

2. Execute the "Mov.Cam. Light" command.

1. Select <3/3/B1 ADJUST TARGET>"Mov.Cam. Light" and press the [ENTER] key.
2. Select "1 Dial + 3 screws".
3. Select "Use" for the special tool.

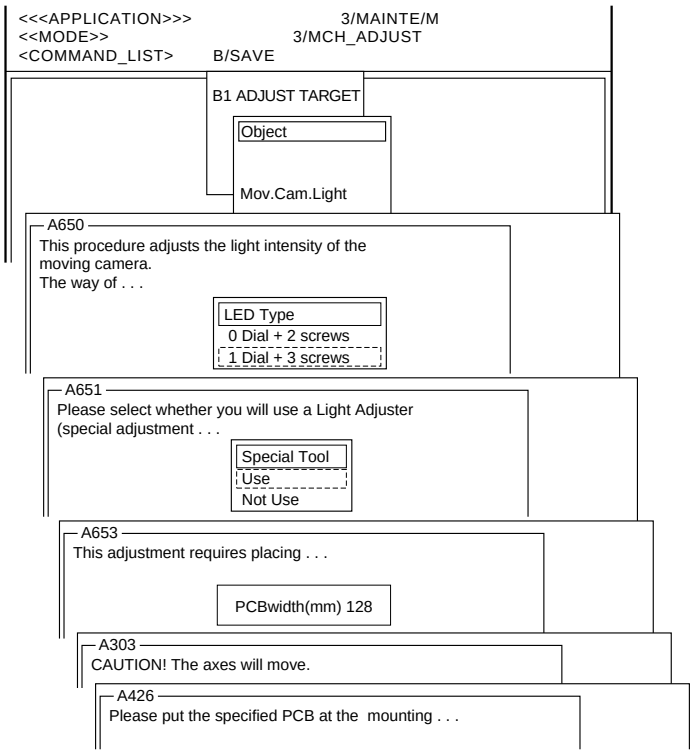


Figure 9-2 Moving camera light adjustment procedure

3. **Enter the width of the PCB and press the [ENTER] key.**
   Enter the width (millimetres) of the PCB used in this adjustment.

4. **Ensure safety, then press the [ENTER] key again.**
   The W-axis moves to set the specified conveyor width.

5. **Press emergency button, set the PCB & light adjuster plate.**
   Align the locate pins with the centre of the positioning holes of the PCB. Then, place the light adjuster plate in the centre of the PCB, with the two-tone surface facing up.

6. **Adjust the conveyor unit.**
   Adjust the positions of the locate pin and push-up pins to match the PCB.

7. **Cancel emergency stop.**
   Ensure safety, then release the emergency stop button and press the [READY] button of the HHK.

8. **Press the [ENTER] key.**
   The locate pins and push-up pins rise to secure the PCB, and the head assembly moves to over the PCB. The teaching screen for the light adjuster plate then appears.

70043306-01.eps

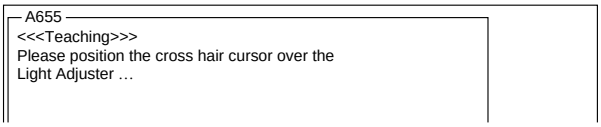


Figure 9-3 Adjusting light intensity

9. **Adjust the camera position.**
   While manipulating the HHK joystick, adjust the position of the moving camera so that the light grey area on the light adjuster plate is displayed over the entire field of view.

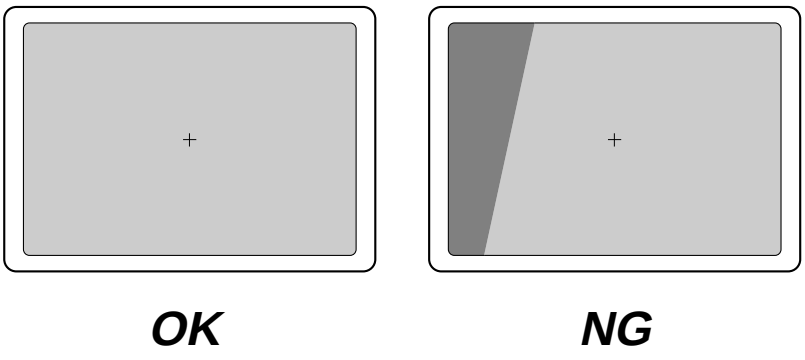


Figure 9-4 Position the light adjuster tool

10. **Adjust the camera lighting level according to the messages.**
    The moving camera lighting pattern is divided into a triple ringed area (outer, inner and coaxial).

Adjust the lighting level for each pattern by using the LED trimmers and selecting the lighting pattern with the rotary switch. Three LED trimmers are located on the side of the moving camera light unit, for adjustment of the outer, inner and coaxial areas. The light level increases by turning the trimmer to the right (clockwise) and decreases by turning it to the left.

Adjust each trimmer so that the “AveGrayLevel" value displayed at the upper right of the operation monitor matches the optimum level indicated in the table below.

70043307-00

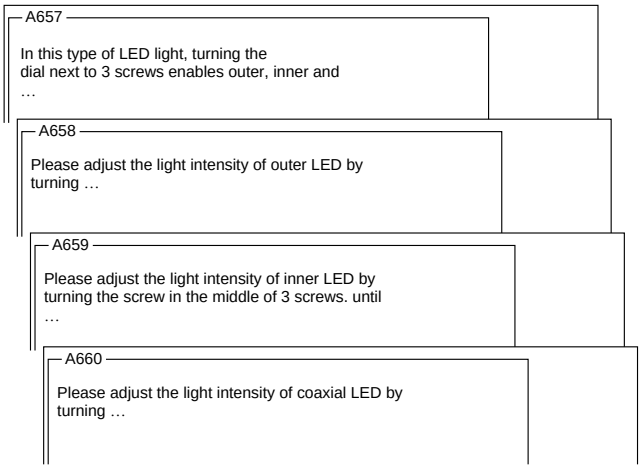

A657
In this type of LED light, turning the
dial next to 3 screws enables outer, inner and
…
A658
Please adjust the light intensity of outer LED by
turning …
A659
Please adjust the light intensity of inner LED by
turning the screw in the middle of 3 screws. until
…
A660
Please adjust the light intensity of coaxial LED by
turning …

Figure 9-5 Calibration procedure

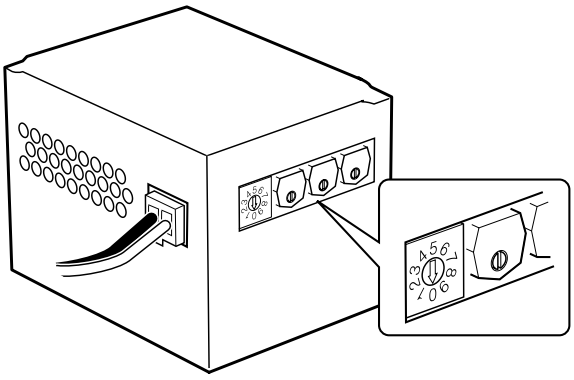


Figure 9-6 Fiducial light adjustment

Rotary SW	Outer	Middle	Inner (coaxial)	Optimum level
0	❍	❍	❍	Normal lighting pattern
1	❍	❍		–
2		❍	❍	–
3		❍		50±5
4	❍		❍	–
5	❍			50±5
6			❍	20±5
7				–

Figure 9-7 Optimum level settings

11. Return the rotary switch to "0".
When adjustment of each lighting pattern is complete, set the rotary switch to "0" (all LED's turned on).

12. Press the [ESC] key to quit the adjustment.
The locate pins and push-up pins are automatically released. After pressing the emergency stop button, remove the PCB. There is no machine data to be saved in this adjustment.

9.3.3. Adjusting the Moving Camera Scale

The moving camera scale is a vision parameter representing a measurement equivalent to one pixel. This scale must be adjusted correctly for accurate recognition of PCB fiducial marks. To make the adjustment, you will need a PCB having a fiducial mark of known size.

1) Preparing the PCB (normal PCB)
Prepare a PCB having a precise fiducial mark that is registered in the database. (When you use a PCB having a mark not registered in the database, it must be registered.)

NOTE: Use of a circular mark is recommended since circular marks are generally superior in dimensional precision to other marks. Use of a 1mm diameter circular mark that faithfully reflects light is especially preferred. (A doughnut shape is not suited for use in this adjustment.)

Check the registration in the mark database.
1. To open the mark database, select <2/3/DATABASE> <A1 COMPONENT /MARK D.B.> "MARK DATABASE" and press the [ENTER] key.
2. Check for the registration data. Check, in particular, that the mark size of the PCB exactly matches the registration data (MarkOutSize). Check also that the Search Area parameter in the Vision Info. sub-window is 4.00 or larger (not too large but also not smaller than 4.00).

70043302-01

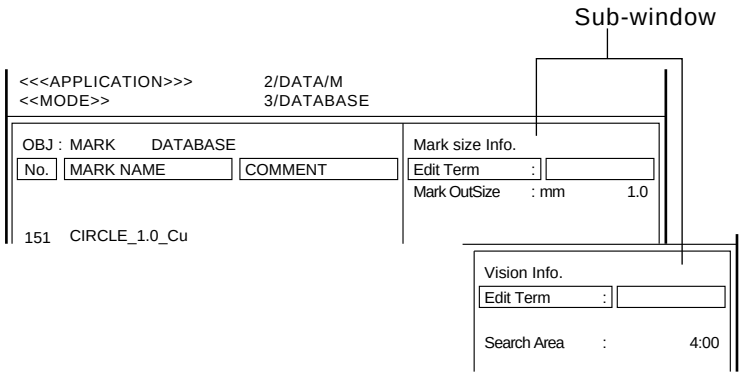


Figure 9-8 Mark data base

Open the Adjust Assist. to check that the mark is clearly recognized.
The Adjust Assistant screen appears by pressing the [F6] key.

Secure the PCB on the conveyor by means of the FIX PCB command.

Adjust the conveyor unit according to the size of the PCB you are going to use. After pressing the emergency stop button, make necessary adjustments to the locate pins and push-up pins. The test board CT-346 is 136mm wide.

Execute the VISION TEST command.
When no errors occur, the current parameter settings are appropriate. Advance to the moving camera scale adjustment in the next section. If an error occurs, adjust the moving camera lighting pattern and/or mark information parameters as necessary. For more details on the parameter settings, refer to the mounter operation manual.

2) Preparing the PCB (glass PCB)
When using a glass PCB specially tailored for camera scale adjustment, follow these steps.

Prepare a glass PCB which is set in the jig.
A glass PCB (within PA1912/00) set with the jig designed for this adjustment is available from PHILIPS. Do not remove the PCB from the jig during adjustment.

Register the mark on the PCB in the mark database.
1. Open the mark information screen.
   Select <2/2/D1 SWITCH PCB DATA> "AMF_QFP" "Mark Info." and press the [ENTER] key.
2. Check that the database Number of the No. 1 mark data is "295".
3. Press the [ESC] key, select the <B2 SET FROM DATABASE> command with the arrow keys and press the [SHIFT] + [ENTER] keys.
4. An alert message appears, but proceed as indicated to execute this command.

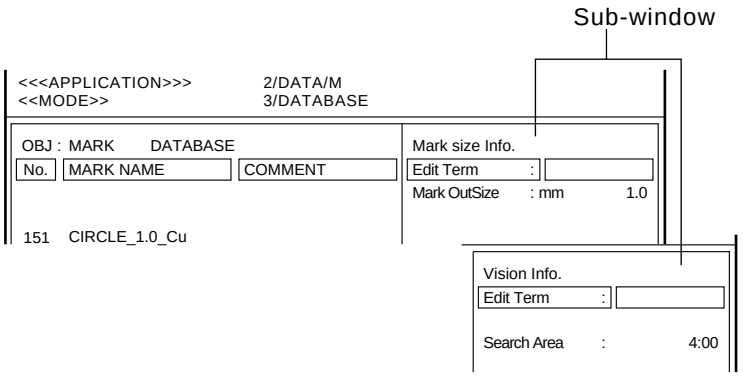


Figure 9-9 Mark info screen

Check for the registration data in the mark database.
1. Open the mark database Select <2/3/DATABASE><A1 COMPONENT/MARK D.B.> "MARK DATABASE" and press the [ENTER] key to open the mark database.
2. Press the [F5] key and then [ESC] key. The CHANGE POSITION box appears, so enter "295" and press the [ENTER] key.
3. Check that the data is entered in No. 295.

Change the moving camera lighting setting.
Set the moving camera rotary switch to "1" so that the lighting is optimized for recognizing the glass PCB.

Check that the mark is clearly recognized in the Adjust Assistant.
The Adjust Assistant screen appears by pressing the [F6] key.

Secure the PCB on the conveyor with the FIX PCB command.
For "CONVEYOR WIDTH", enter "130". Then, press the emergency stop button and make necessary adjustments to the locate pins and push-up pins.

Execute the VISION TEST command.
When no errors occur, the current parameter settings are appropriate. Advance to the moving camera scale adjustment in the next section. If an error occurs, adjust the mark information parameters as necessary. For more details on the parameter settings, refer to the mounter operation manual.

3) Adjusting the moving camera scale

When you have prepared the PCB, use the following steps to calibrate the moving camera scale.

Execute the "Mov.Cam. Scale" command.
Select <3/3/B1 ADJUST TARGET> "Mov.Cam. Scale" and press the [ENTER] key.

70043308-00

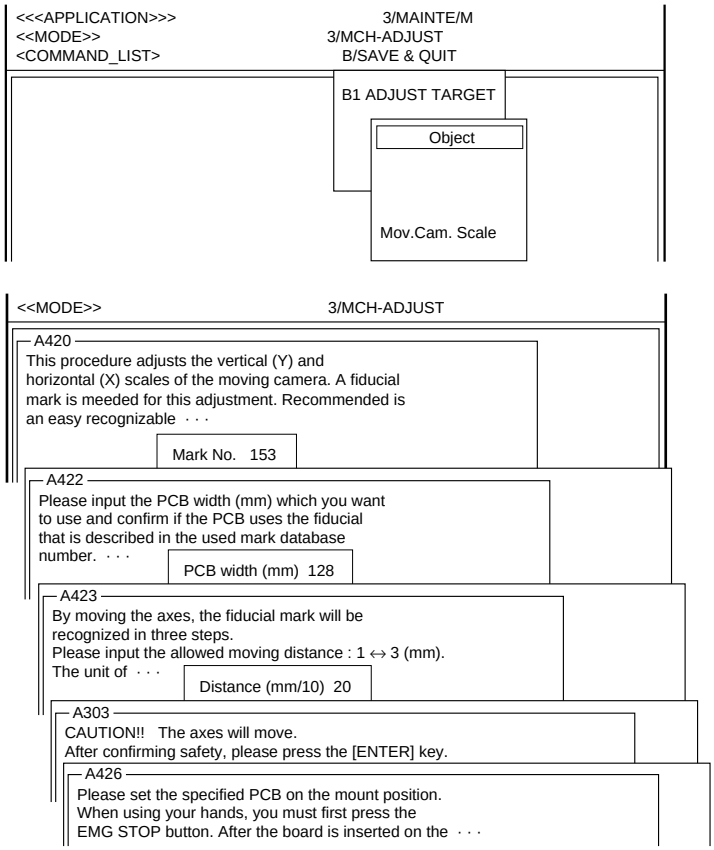

<<<APPLICATION>>>
<<MODE>>
<COMMAND_LIST>
3/MAINTE/M
3/MCH-ADJUST
B/SAVE & QUIT
B1 ADJUST TARGET
Object
Mov.Cam. Scale
<<MODE>>
3/MCH-ADJUST
A420
This procedure adjusts the vertical (Y) and horizontal (X) scales of the moving camera. A fiducial mark is meeded for this adjustment. Recommended is an easy recognizable · · ·
Mark No. 153
A422
Please input the PCB width (mm) which you want to use and confirm if the PCB uses the fiducial that is described in the used mark database number. · · ·
PCB width (mm) 128
A423
By moving the axes, the fiducial mark will be recognized in three steps.
Please input the allowed moving distance : 1 ↔ 3 (mm).
The unit of · · ·
Distance (mm/10) 20
A303
CAUTION!! The axes will move.
After confirming safety, please press the [ENTER] key.
A426
Please set the specified PCB on the mount position.
When using your hands, you must first press the EMG STOP button. After the board is inserted on the · · ·

Figure 9-10 Moving scale adjustment

Enter the mark database No. and press the [ENTER] key.
Here, enter the database No. of the mark on the PCB you are using.

Check or enter the width of the PCB and press the [ENTER] key.

The width of the Phillips board is 136mm and of the glass PCB130mm.

Confirm that "Distance (mm/10) 15" is displayed, and press [ENTER].
Normally, a movement distance of "15" (in tenths of a millimeter) is recommended.

Ensure safety, then press the [ENTER] key again.
The W-axis moves to set the specified conveyor width. (When you have already adjusted the conveyor width for performing the Adjust Assistant in the previous section, the W-axis does not move.)

Press the emergency stop button, then set the PCB in position.
When the PCB has already been set on the conveyor, skip this step.

Cancel emergency stop.
If you have set emergency stop in Step 6, release the emergency stop button and press the [READY] button on the HHK.

Ensure safety, then press the [ENTER] key.
The locate pins and push-up pins rise to secure the PCB, and the head assembly moves to over the PCB. The teaching screen for the fiducial mark position then appears.

70043309-00

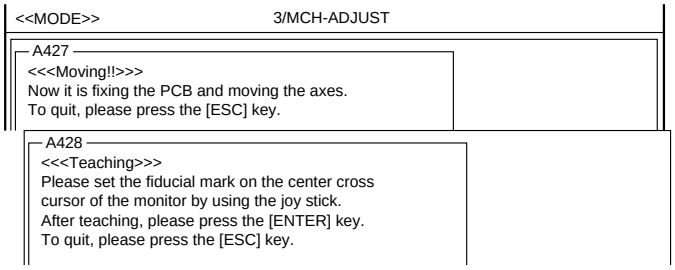

<<MODE>>
3/MCH-ADJUST
A427
<<<Moving!!>>>
Now it is fixing the PCB and moving the axes.
To quit, please press the [ESC] key.
A428
<<<Teaching>>>
Please set the fiducial mark on the center cross
cursor of the monitor by using the joy stick.
After teaching, please press the [ENTER] key.
To quit, please press the [ESC] key.

Figure 9-11 Teaching fiducials

Position the fiducial mark in the center of the screen.
Manipulate the HHK joystick to align the mark with the cross cursor in the center of the screen.

70043305-00

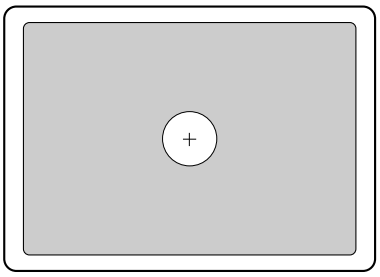


Figure 9-12 Mark info screen

Press the [ENTER] key to start calibration.
The moving camera moves in both X and Y directions.
The amount of movement on the vision monitor is calibrated and the results are then displayed on the screen.

70043311-00

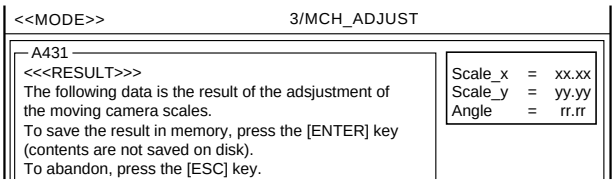

<<MODE>> 3/MCH_ADJUST
A431
<<<RESULT>>>
The following data is the result of the adsjustment of the moving camera scales.
To save the result in memory, press the [ENTER] key (contents are not saved on disk).
To abandon, press the [ESC] key.
Scale_x = xx.xx
Scale_y = yy.yy
Angle = rr.rr

Figure 9-13 Start calibration

The correct values for the moving camera are as shown in table 9-1.

Average FOV	Scale range of X and Y value	X/Y scale ratio	Angle R
4.8mm	10.5 ±0.2 (µm/pixel)	1.00 ±0.01	0° ±0.5°

Table 9-1 Moving camera

If the scale value is not within limits move the camera up or down and adjust the camera scale again.

If the rotation is off rotate the camera and adjust the camera scale again.

Press the [ENTER] key to save the calibrated results.
Press the [ESC] key if you want to cancel the results.

Save the calibration settings.
Select <B2 SAVE DATA> or <B0 SAVE & QUIT> and press the [ENTER] key. (To quit without saving, select <B3 RECOVER ADJUST> or <B7 QUIT> and press the [ENTER] key.)

Press the emergency stop button, then remove the PCB.
Before removing the PCB the clamping must be removed, this can be done by means of the DO screen.

9.4. Single Camera Adjustment

This section describes the calibration of the single camera. If not installed than skip this section.

9.4.1. Maximum Component Size and Field Of View

This procedure explains how to adjust the maximum component size. The maximum component size is directly related to the Field Of View. For the Topaz the recommended Field Of View is 37mm or larger, the maximum component is 32mm square.

To adjust use a transparent ruler sheet (tip: copy on a copy machine a ruler on a transparent sheet).

Set the focus ring in the middle position.
Select the adjust assistant (<F6>-key), pick up the ruler sheet and bring it above the single camera on which you want to adjust the aperture. Adjust the Field Of View size by shifting the camera up or down.

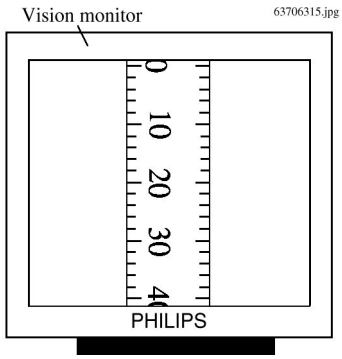


Figure 9-14 Ruler sheet on the vision monitor

NOTE:
Adjusting the Field Of View too large may give problems with the nozzle back plate. If you can see two stripes on the screen as shown in the figure 9-15 below please readjust again.

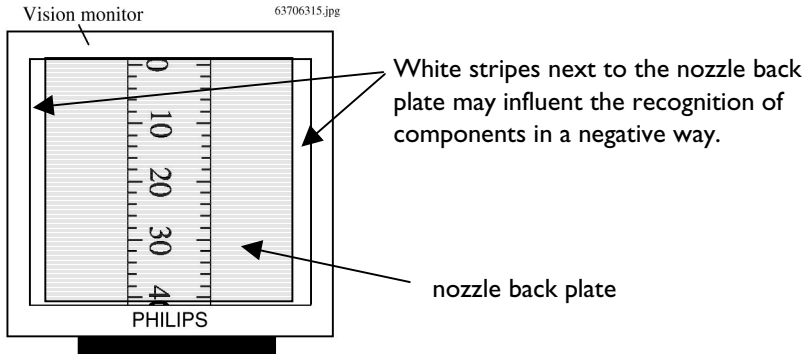


Figure 9-15 Nozzle back plate sides visible

9.4.2. Focus Adjustment

To adjust the focus the special focus adjuster tool can be used. The focus adjuster (5322 395 10275) is also used to adjust the cameras of the Orion, Topaz or Sapphire.

- Prepare a component in the component database so that the focus adjuster can be picked up (with nozzle type 33or 34). Make sure the component thickness Z=0 and that the component (focus adjuster) is recognised at the correct camera.
- Set the focus ring on the lens to the "- 0.5" position before adjusting the focus.

NOTE: The Focus adjustment tool can only be used with a Fore lighting system. Set the Alignment Module to Fore.

- Press F6 adjust assist.
- Mark the nozzle position with a permanent marker onto the pick up surface of the focus adjuster tool, see figure 9-16. This ensures that the tool is attached to head 1 at a fixed position.
- Pick up the focus adjuster tool as shown in figure 9-16.

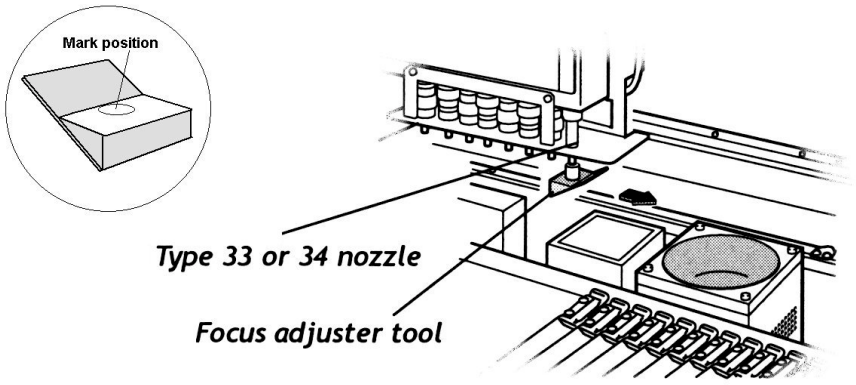
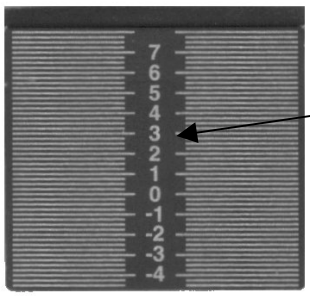


Figure 9-16 Focus adjuster tool direction



Adjust the focus by shifting the camera up or down, see figure 9-17.

At the level 3 position of the focus adjuster tool the focus must be optimal.

The machine will take in to account the Z-height of the component and will subtract that number from the Camera Z-co-ordinate.

Figure 9-17 Nozzle back plate sides visible

The bottom of the component will always be recognised at the same Z position.

The focus adjustment influences the maximum component size adjustment, so take care of that and find the optimum value for both focus and maximum component.

NOTE: The focus must be adjusted by moving the camera up or down, not by turning the focus ring. Only use the focus ring adjustment if no good results can be obtained. This because it is a very precise adjustment.

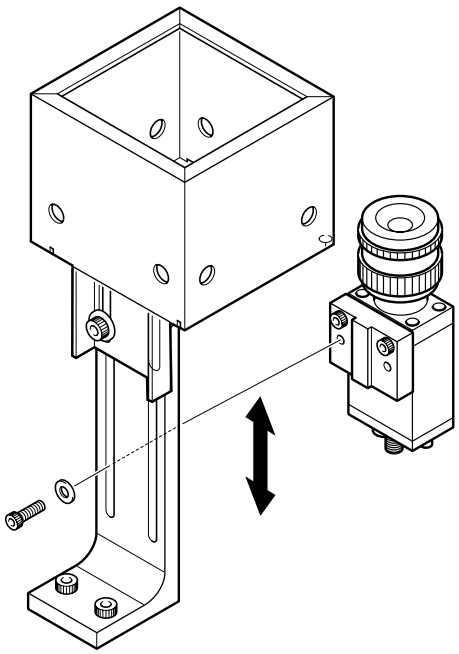


Figure 9-18 Nozzle back plate sides visible

9.4.3. Lighting Level Adjustment

This section describes how to adjust the lighting level of the Single vision camera. This can be done in two different ways, proceed as indicated in following steps.

1. The lens aperture setting (diaphragm) of the single camera is corrected automatically in software while doing the (fore-) light adjustment. The aperture ring on the lens of the single camera must be set in-between position “F2” and “F4”.
2. Execute the “SingleCam.Light” utility as follows:
   - Select <3/3/B1/Adjust target/SingleCam.Light> and press <Enter>.
   - Enter the database number of the component you are using for this adjustment and press <Enter>. If you have added an optional high-precision vision camera select “SingleCam2” to adjust it.
   - Enter the feeder set number and press the <Enter> key. When the selected component is registered as a tray component, this dialog box does not appear.

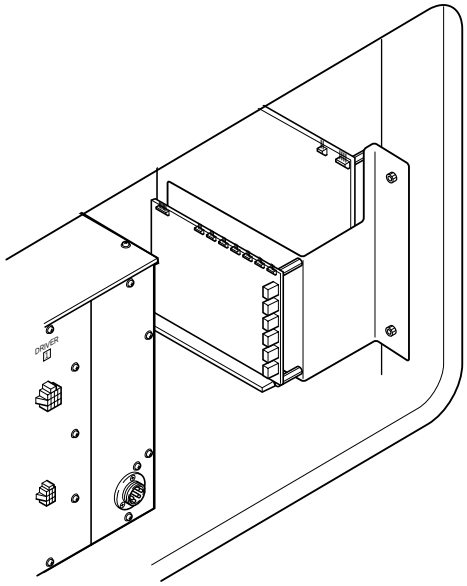


Figure 9-19 Led driver board

3. Ensure safety then press the <Enter> key again.
   The head assembly moves to above the single vision camera and measurement of brightness around the nozzle will start.
4. Adjust the single vision camera lighting level with pot-meter VR2 on the LED driver board (second potentiometer from the bottom) at the right side of the MCX controller. Adjust the "AveGrayLevel on the upper right corner of the screen to 32 +/-3. If this value cannot be reached please adjust the aperture ring a little and try again.
5. Press <Esc> or <Enter> to quit the adjustment, There is no machine data to be saved in this adjustment.

Optional adjustment method:

1. Select:<3/3/B1/SingleCameralighting/SingleCamera/ Front-light>.
2. Follow the explanation on the VIOS monitor and adjust the LED driver-board potentiometer VR2.
3. Use the Light adjuster-tool, 5322 395 10274.
4. Adjust the potentiometer so that the border between dark and bright is one full scale (64 levels), see fig.9-20.

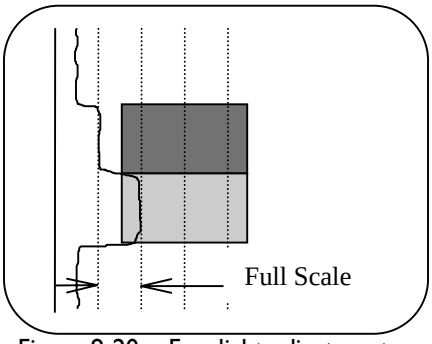


Figure 9-20 Forelight adjustment

NOTE: Finish the adjustment within 30 seconds because the lighting level becomes lower and lower. Check the gap between dark and bright, not the absolute value.

9.4.4. Camera Scale Adjustment

For accurate recognition of components such as QFP's, the lighting level and the scale of the single vision camera (fixed camera) must be adjusted correctly. The single vision camera scale represents an actual measurement (in units of microns) equivalent to one pixel. For accurate recognition of components, this scale must be adjusted correctly. To make the adjustment, you will need a QFP of known size.

Preparation for the single vision camera scale

First check the current settings of the single vision camera scale.

1. Select 3/2/A/MCH_DATA>/{A1/SELECT TARGET} /"Vision Parameter" and press the [ENTER] key.
2. Check the settings of "SingleCAM. scale".
   When you execute the single camera scale utility, the X and Y values (microns) will be adjusted.

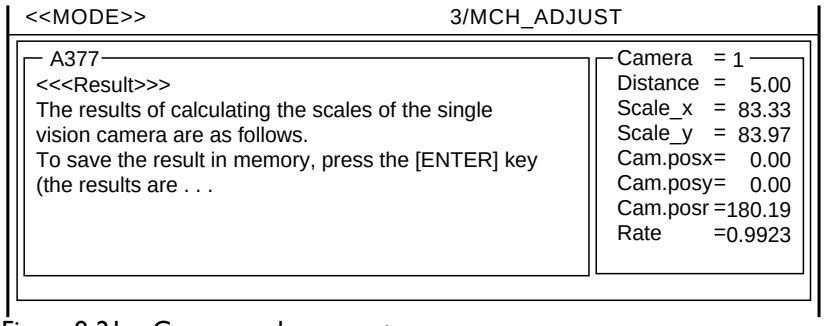

<<MODE>> 3/MCH_ADJUST
A377
<<<Result>>>
The results of calculating the scales of the single vision camera are as follows.
To save the result in memory, press the [ENTER] key (the results are . . .
Camera = 1
Distance = 5.00
Scale_x = 83.33
Scale_y = 83.97
Cam.posx= 0.00
Cam.posy= 0.00
Cam.posr =180.19
Rate =0.9923

Figure 9-21 Camera scale parameters

3. Prepare a QFP component to be used.
   Use a relatively large, often used component of known size, which is registered in the component database. (If you use a component not registered in the database, it must be registered first)

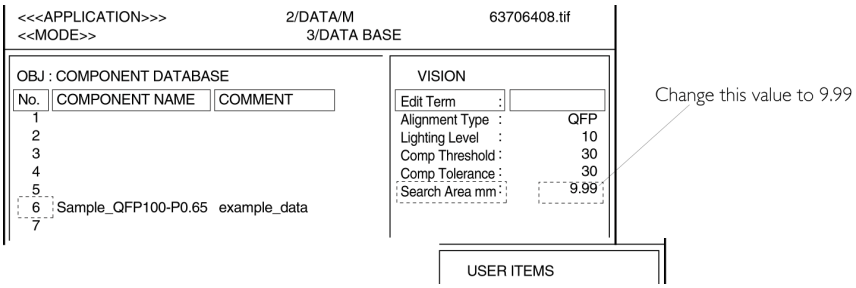
NOTE: Use of a QFP component is recommended since QFP's are generally superior in dimensional precision to other components, PHILIPS recommends using QFP components registered in the database, e.a."No.766; QFP100-P0.65-25.7L" or "No.767; QFP100-P0.65-24.7L". You can also use the inner QFP 68 of the glass calibration set (PA 1912/00) but this can give problems with the outer glass QFP208 .

4. Check the registration data in the component database.
   - To open the component database, select <<<2/DATA/M>>>/ <<3/DATABASE><A/DISPLAY>/ {A1/COMPONENT/MARK D.B.}/ "COMPONENT DATABASE" and press the [ENTER] key.
   - Check the registration data of the selected QFP.
     In particular, check that the component size exactly matches the registration data. If not, the adjustment will be aborted.

5. Edit "Search Area mm" in the component data.
   Data registered in the database as a number larger than No.500 cannot be edited due to write-protection. Make a copy of the data as a number smaller

than No.500, then edit this data. For instance, the following steps are explained in cases where a copy is made onto registration No. 6.

- Open the sub-screen "Vision" for the component of registration No. 6.
- Edit the data on "Search Area mm".
- Use the numeric keys to set the normal value "4.00" to "9.99" (maximum setting). This is for off-center pickup of the QFP to be performed later.



F
igure 9-22 Edit search area

6. Save the edited data.
   Press the [ESC] key twice, then select {C0/SAVE & EXIT} and press the [ENTER] key.

Adjustment of the camera scale

When the preparation is complete, use the following procedure to calibrate the scale of the single vision camera.

1. Execute the "SingleCam. Scale" utility.
   Select <<<3/MAINTE/M>>>/<<3/MCH_ADJUST>>/<B/SAVE & QUIT>/ {B1/ADJUST TARGET}/ "SingleCam. Scale" and press the [ENTER] key. Select "SingleCam.1" and press the [ENTER] key. If you have added an optional vision camera, select "SingleCam.2" to adjust it.

NOTE: Camera scale adjustment on a camera using side illumination need to be run with a part that uses the fore lighting system. If a part cannot be recognized, check the Single Cam. Scale levels in [MCH_DATA]→Vision Parameter. The following numbers should be close to what the scale adjustment will find if the field of view is set correctly.

Max component size	X	Y	Lens
32mm	77.5	77	Lens 16

Table 9-2 Scale adjustments

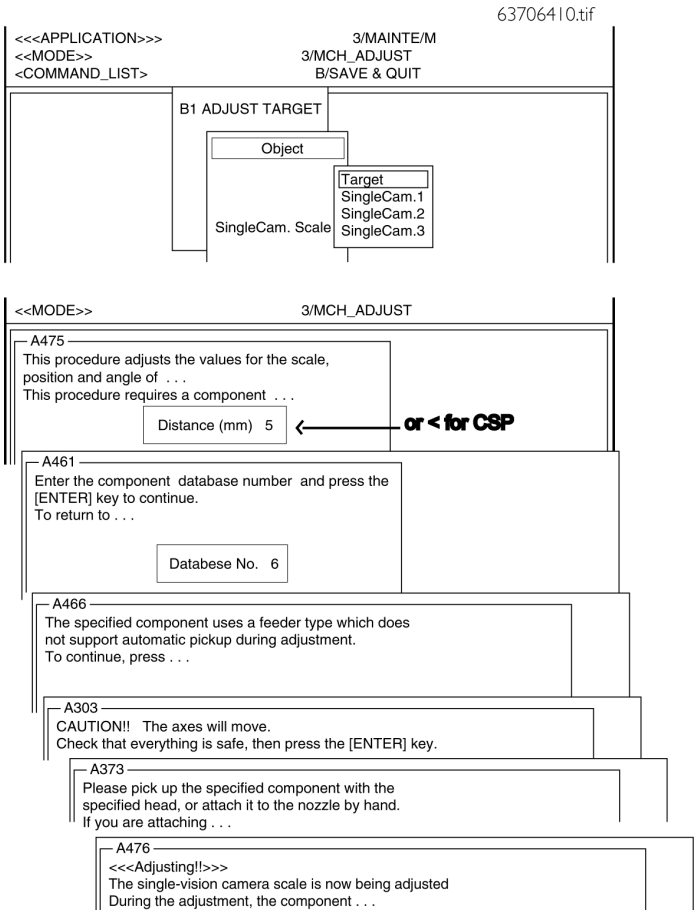


Figure 9-23 Procedure of scale adjustment

2 Confirm that distance (mm) 5 is displayed and press the [ENTER] key. Normally, a movement distance of 5 (millimetres) is recommended.

3 Enter the component database No. and press the [ENTER] key. Here, enter the database No. 6 you have edited previously.

4 Ensure safety, then press the [ENTER] key twice. The head assembly moves to a point where Head 1 is ready to pick up a component.

5 Press the emergency stop button, then attach a QFP to Head 1 by hand. Attach the QFP to the nozzle so that it is slightly off-center in relation to the nozzle tip (as long as the component does not go out of the field of view during component recognition).

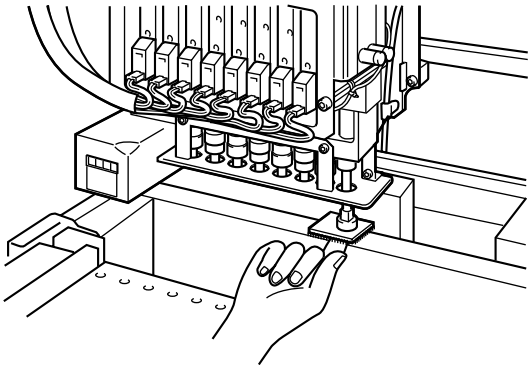


Figure 9-24

CAUTION

When you use a rectangular QFP, align the long side in parallel with the X-axis.

6. When the QFP has been attached, press the [ENTER] key.
7. Cancel emergency stop.
   Release the emergency button and press the [READY] button of the HHK.
8. Ensure safety, then press the [ENTER] key again.
   Head 1 moves to above the single vision camera and the QFP is displayed on the vision monitor. The nozzle rotates so that the camera scale, position and angle are calibrated five times. The results are displayed in the upper right corner of the VIOS monitor.

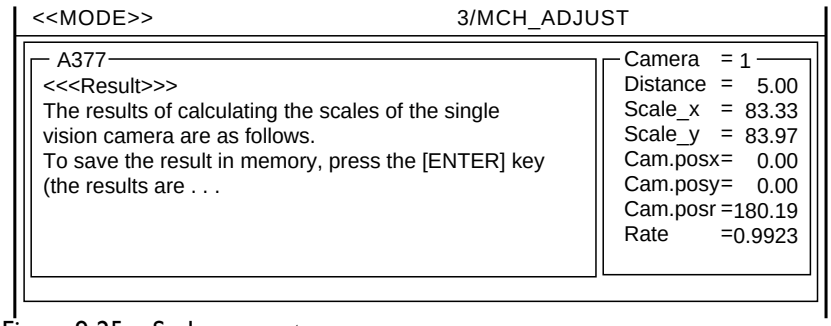


Figure 9-25 Scale parameters

9. Press the [ENTER] key to save the calibrated results.
   Press the [ESC] key if you want to discard the results.
10. Note the camera position XY in the results.
    When the "Cam.posx" and "Cam.posy" values are nearly zero (0.00 ±0.01), the calibration is satisfactory. Press the [ESC] key to advance to the next Step.
    If the "Cam.posx" and "Cam.posy" values are too far from zero, there is likely an error in the calibration. Press the [ENTER] key to retry calibrating.

NOTE: Verify the Cam.posx and Cam.posy values to be 0.00 by running the scale utility again.
One of the most important items of camera scale is that these values go to zero and are stabile. If the position move by .05 or more with each run of scale then a mechanical problem exists (loose elements in the lens or lens that is loose on the camera).

11. When the calibration is complete, dump the component.
    Press the [ENTER] key to dump the component automatically.
    If you want to quit without dumping, press the [ESC] key and follow the message on the operation monitor.
12. Save the calibration data.
    Select {B2/SAVE DATA} or {B0/SAVE & QUIT} and press the [ENTER] key. To quit without saving, select {B3/RECOVER ADJUST} or {B7/QUIT} and press the [ENTER] key.

At the completion of a scale adjustment the following parameters are given. It is important to execute the utility 2 or 3 times before relying on this data.

DISTANCE = 5
The component movement distance specified during the adjustment.
SCALE X = 83.33
Pixel value in microns.
SCALE Y = 83.97
Pixel value in microns.
CAM. POS X = 0.00
Indicates the distance the center of the camera was moved from the last recorded position in Machine Data.
CAM. POS Y = 0.00
Indicates the distance the center of the camera was moved from the last recorded position in Machine Data.
CAM. POS R = 0.56
The current rotational position of the camera. Not to exceed +/- 1 degree.
RATE = .9955
The Ratio of X to Y pixel measurement.

9.4.5. Camera Optical Axis Angle Adjustment

Introduction

The Camera optical axes angle adjustment is a procedure that allows for the measurement of the relationship between the cameras optical axis and the Z axis movement of the head or Spine assembly. It can be used on the Topaz with an additional single camera.

This relationship plays an important role in the placement accuracy between QFP and Fine Mode and becomes more significant when 2 or more single cameras are used.

Current software revisions do not allow for independent Offsets settings for each camera. This limitation results in a deviation in mounting accuracy that will exist between the cameras if their mechanical alignment in relation to the machine's moving axis is not equal.

On Machines that have Fine Mode Capabilities this effect is significantly reduced providing that all cameras are used only in Fine Mode. Fine Mode recognition has the ability to mask a significant portion of mechanical deviation and reduces its influence on mounting accuracy.

For the Topaz system this adjustment can be used if more then one single view camera is installed and the customer uses both the QFP and Fine-mode.

Measurement Principles

During the machine calibration the verification of the optical axis should be performed immediately following the camera scale function and is in principle only needed after (re-) installation of the camera.

The primary focus of the utility is to align the camera in respect to the moving axis of the machine. To accomplish this we will measure the head at the different Z positions above the camera. A properly aligned camera will have very small deviation between the center of the camera and the path of the spline. If adjustments are required, the camera must be shimmed or repositioned on the camera stand.

Single Camera

For the single vision camera, the program REC_COM.pgm is used. This program is similar to the Auto Mount feedback routines and is executed in the same manner. Unlike the standard AMF programs, the camera utility will not effect the machine's calibration data.
This program REC_COM.pgm has been written to help to determine if a deviation exists and give us the ability to measure the deviation. The results of the measurement are displayed on the VIOS monitor. It is also possible to save the result on a floppy for importing into the Microsoft Excel template CAM_POS.xls. The Excel template creates a graph that provides a visual interpretation of the results as well as a measurement history that is very useful for comparing prior adjustments.

The measurement should be done directly after the scale adjustment is done. If the results show that a mechanical readjustment is needed and consequently is carried out, a new scale calibration adjustment is needed at the end.

To Correctly measure the relationship between the Single camera and Z-axis the program REC_COM.pgm is used. This program measures a component at 4 angles and at different Z positions in the optical plane. The results are displayed on the monitor and can be saved to disk.

The utility program, REC_COM.pgm can be obtained from the system 3 disk of VIOS 1.20-3 or later as well as the Glass Adjustment Kit. The Microsoft Excel template CAMPOS.xls can be obtained electronically from Philips Technical Support.

This adjustment should be performed immediately following the camera scale adjustment of the machine calibration procedure.

Line Array Camera

Unlike the single camera, the line array camera does not require an external program. The standard camera scale utility available in [Machine Adjust] is used. The head assembly is raised and lowered during the utility. The component is measured at several angles and positions above the camera. The results are displayed in a table at the completion of the scale measurement. This table contains the camera scale, rate and head delta information. The camera's position and angle are indicated by the camera delta or camera correction information (CAM.COR).

Required Tools and Supplies

1. Square shaped QFP (recommended for single camera alignment)
2. Thin shims (ranging from 0.05mm to 0.2mm)
3. Allen wrenches

Single Camera Adjustment

The following steps will guide you through the REC_COM utility.

Preliminary steps:

1. Loading Utilities.
   Check if the REC_COM.pgm is available in the c:/PGM directory. If not, use the SHELL manager to copy the REC_COM utility to the c:/ PGM directory.
2. Component Preparation.
   In the Philips DataBase, select or create the vision file you wish to use. Use a square component like the QFP48 or glass QFP2S. If using the glass QFP2S from the Glass Adjustment kit, set the [Multi Detection] to Adjust Mode 2.
   F6 Adjust the component and record the components lighting level.
3. Set the Search area to 9.99

REC_COM

1. Program Execution.
   a. Execute the REC_COM.pgm in the same manner as a standard AMF program.
   b. Highlight "Machine Config" and select <CNTRL+ENTER>
   c. Select Change Program and file name.
   d. Select F5 to initiate. The program will need about 25 seconds to load.
2. Select Machine type: 1= Topaz, 2= Emerald-Eclipse
3. Select 1, Pick up component.
4. Select 3, Camera Position.

Component DB no1	=	Data Base number
Component DB no2	=	0
Component Height	=	Component Z
Add 1mm if you are using a type 33/34 nozzle		
Lighting Level	=	Level from component vision file
How many Times	=	Number of times to recognize the component at all 4 angles at every Z reference position. 2 is sufficient, 10 if you have all day.

Adjust Component R	=	Select NO, yes will cause a Fine mode type of adjustment. The component's angle will be verified and corrected prior to each X/Y measurement.
Height Range from	=	Select –2. (Do not forget the decimal point)
Height Range to	=	Select 2. (Do not forget the decimal point)
How many Steps	=	5-10 is recommended

As the program runs the head starts in the top most position and moves down throughout the camera's field of view.
If the vision system fails to recognize the component too many times, the program will display the Soft Limit Over Error message. If this occurs, Verify the Search area is 9.99 and component focus is good.

Evaluating the Results

After the program completes the measurement, a table of results will be displayed on the VIOS monitor.

The data in the table is presented in a format that represents a downward movement of the spline beginning at -2 mm above the recognition height to a point 2mm below. In this table, the total deviation for each axis should not exceed 20 microns (0.020mm).

Example of the results table:

REC.Height = -2.0	Camera Pos	X = 320.467	Y = 140.295
REC.Height = -1.6	Camera Pos	X = 320.463	Y = 140.287
REC.Height = 0.0	Camera Pos	X = 320.460	Y = 140.281
REC.Height = 1.6	Camera Pos	X = 320.457	Y = 140.273
REC.Height = 2.0	Camera Pos	X = 320.452	Y = 140.266

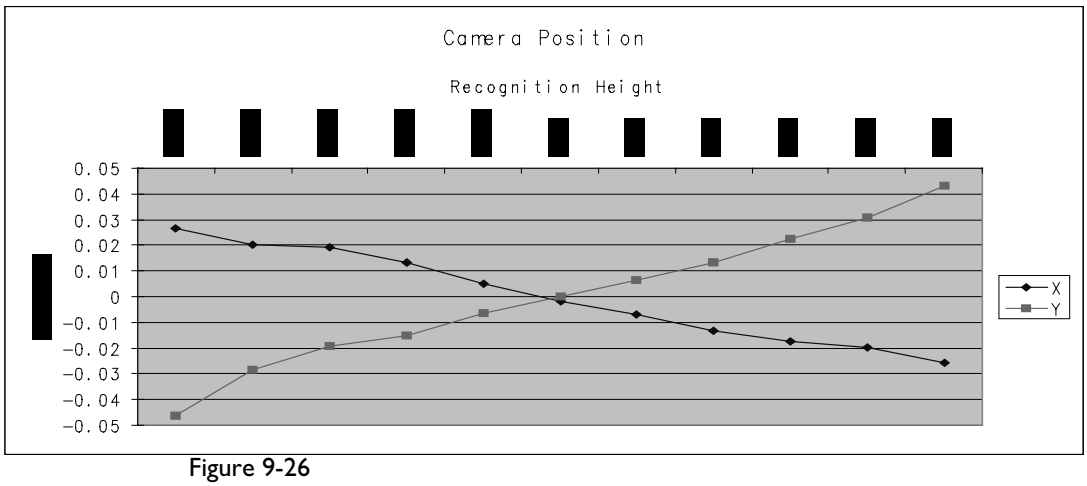


Figure 9-26

If the deviation exceeds 0.02mm per 4mm, it is recommended that you save the data to a floppy and use the Excel Template to determine the camera position. As you make adjustments, the template will provide history data that is very useful to visually interpret the amount and direction of correction yielded by each adjustment.

5. Place a floppy in the A: drive, when prompted to save the data.
6. Run the Cam_pos.xls and import the information into this program by clicking on the [a:\results.dat] button.
7. Observe the value of the numbers to the right of the decimal point. The numbers should increase or decrease uniformly. If the numbers indicate a sudden rise or fall of 0.01 or more, run the program again to verify results. If the deviation returns or if measurements seem random, check the spline shaft, nozzle holder, camera lens and the vision file. A small rise and fall in the values is perfectly acceptable and will be a normal indication. It is only important that the overall deviation remain within the 0.02 per 4mm tolerance. If not, carry out the following steps:
   - If the Y-axis deviates negative to positive (L-R) then, the top of the camera must move towards the rear of the machine. A shim must be placed between the camera body and adapter plate (see figure 9-27).
   - If the X-axis deviates positive to negative then, rotate the top of the camera in the direction of machine origin. it may be necessary to remove the camera and realign the adapter plate to the camera.
8. After a correction is made, a new scale measurement **must be performed** before the REC-COM command can be repeated.

REMARK:
Sometimes it can be the case that the bolts (M3x10) holding the lighting unit are too long and as such protruding through the camera stand pressing against the camera bracket. This can cause a tilted camera body. Adding some washers between the bolt and camera stand can prevent it.

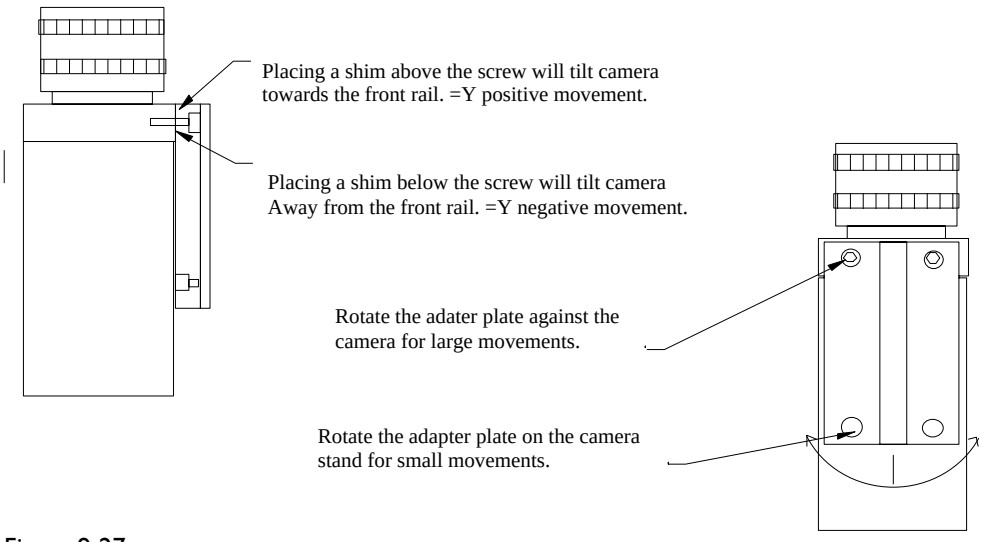

Placing a shim above the screw will tilt camera towards the front rail. =Y positive movement.
Placing a shim below the screw will tilt camera Away from the front rail. =Y negative movement.
Rotate the adater plate against the camera for large movements.
Rotate the adapter plate on the camera stand for small movements.

Figure 9-27

9.5. Line Array Camera Adjustment

This section describes the calibration of the line array camera(s).

9.5.1. Maximum Component Size and Field Of View

This procedure explains how to adjust the maximum component size / Field Of View. The field of view is everything the camera can recognize ("see") on its focal plane. The maximum component is always smaller than the Field Of View and is the FOV minus the deviation of the lens border, so the size within the FOV in which a component can be recognized without problems.
Measure the Field Of View by means of a plastic ruler. Attach the ruler in such a way that the ruler is visible in X-direction (East-West direction) on the screen as the X-direction is a fixed value of 58.59. The Field Of view depends on the height of the line array camera as well as the used lens and extension ring. Adjust the FOV to 33mm.

9.5.2. Adjusting the Focus and Aperture

To adjust the focus and aperture a special focus adjuster tool (5322 395 10275) is necessary. Follow the steps below.

1. Press the emergency stop button and prepare for adjustment:
   - Loosen the set-screws of the aperture ring and lens holder.
   - Prepare the light adjuster tool.

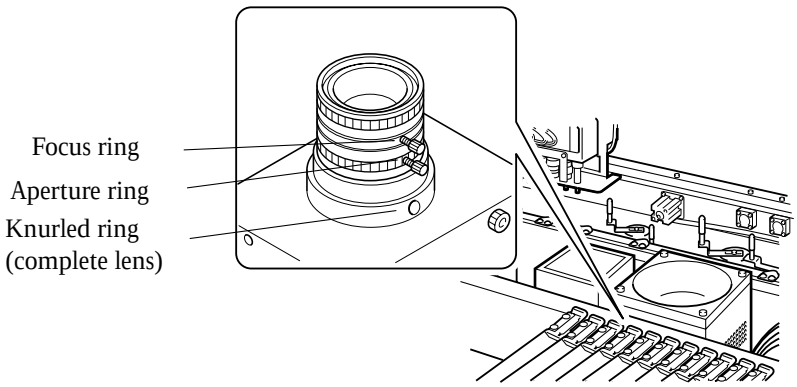


Figure 9-28

2. Execute the line array camera "Focus and Iris" command:
   - Select <3/3/B1 Adjust target/Multi-camera/Focus & Iris> and press the <Enter> key.
   - Select "Use" for the special tool.
   - Select the camera to be adjusted.
3. Attach the focus adjuster tool to head 1 as follows:
   - Attach a type 33 nozzle to head 1, if done by hand press the emergency button prior to this action.
   - Check that the emergency button is pressed.

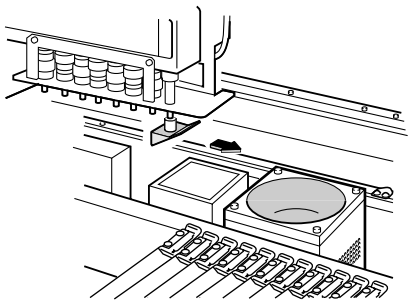


Figure 9-29

4. Cancel the emergency stop.
   Ensure safety, release the emergency stop button and press the <Ready> button on the Hand held keyboard.

5. Ensure safety and press the <Enter> key again.
   The head assembly moves and passes repeatedly over the line array camera while the image of the focus adjuster tool and its intensity profile is displayed on the vision monitor.

6. Adjust the Focus and aperture.
   By rotating the aperture and focus (by means of the lens holder) the optimum image in a scale range of –1 to 6 as shown in the figure must be found.

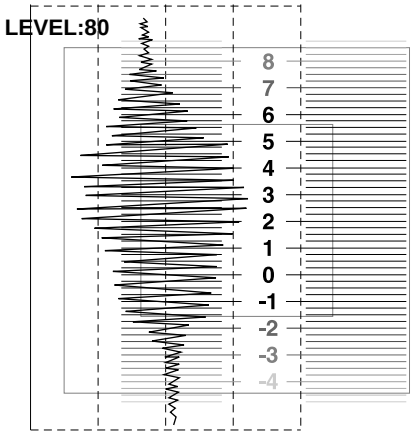


Figure 9-30

One way of performing this adjustment is following:

- Open the aperture for maximum light with a minimum depth of field (bottom lens ring) and set the focus ring (upper lens ring) to –0.5. You will only see one peek on the screen, rotate to lens holder (complete lens) up/down to shift this peek to the "3" value on the adjuster tool.
- Adjust the aperture (close it) to increase the depth of field to the scale value of –1 to 6 on the adjuster tool.
- If it is not possible to adjust it in this way the cause may be the amount of light might which is too much or too low. Try closing the aperture a little or if this will not work increase the lighting intensity on the LED driver board (see next paragraph).
- In case of two line array cameras try to obtain the same lighting level on both front and rear camera.

WARNING

The head assembly passes repeatedly over the multi-vision camera during the adjustment. Be extremely careful not to touch the head with your body !

7. Press the <Enter> or the <Esc> key when the adjustment is complete. Follow the messages displayed on the operation monitor. There is no machine data that needs to be saved after this adjustment.

8. Tighten the set screws.
   - Press emergency and remove the adjuster tool from head 1.
   - Tighten the screws (not too tight !) of the aperture and lens holder. Recheck the focus after tightening.

9.5.3. Adjusting the Lighting Level of the Line Array Camera(s)

To adjust the lighting level of the line array camera(s) you will need the special light adjuster plate (5322 395 10274). The lighting level is adjusted on the LED-driver board located on the left side of the MCX-controller while an image is displayed on the monitor, proceed as follows:

1. Execute the "Multi-camera/Brightness level"
   - Execute the multi-camera <3/3/B1 Adjust target/Multi-camera /Brightness> and press the <Enter> key.
   - Select "going on and off" from the LED type box.
   - Select "Use" from the special tool box.
   - Select the camera to be adjusted.

2. Press the emergency stop button and attach the light adjuster plate to head1. Attach the light adjuster plate to head 1, with the two-tone surface facing down. Orientation of the light adjuster plate must be such that the boundary line between the two-tones is set horizontal on the screen.

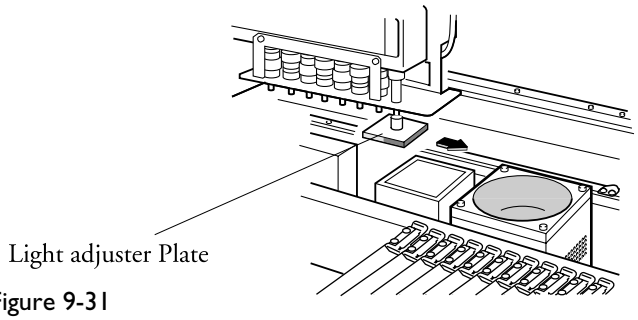


Figure 9-31

3. Cancel the emergency stop.
   Ensure safety then release the emergency stop button and press the <Ready> button on the HHK.

4. Ensure safety, then press the <Enter> key again. The head assembly moves repeatedly over the multi-view camera while the image of the light adjuster plate is displayed on the vision monitor.

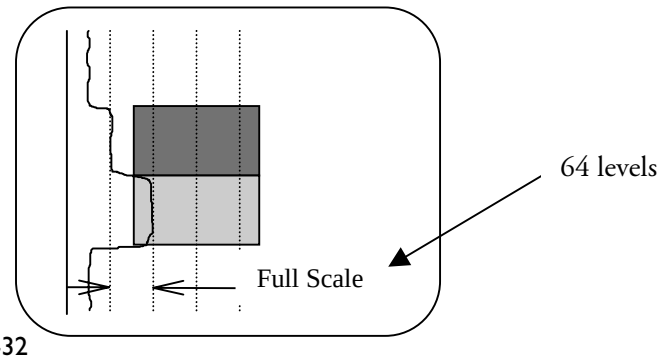


Figure 9-32

5. Adjust the non-coaxial light level

Open the lower right cover door of the machine and you will see the LED driver-board. Turn trimmer VR6 for line array camera 1 and VR4 for camera 2 in such a way that the brightness difference between the two tones is set to one scale (64 levels). If your machine has two line array cameras perform the same adjustment for both cameras.

6. Press the emergency button and invert the light adjuster plate.
   Turn the light adjuster plate up side down and re-attach it to head 1, the white surface facing down.

7. Cancel the emergency stop and press the Enter key.
   Only the coaxial light turns on and the average brightness level is displayed on the upper right corner of the operation monitor.

8. Adjust the coaxial light level.
   Turn the trimmer VR5 for line array camera 1 and VR1 for camera 2 in such a way that the average brightness level becomes 30.

NOTE: If the average light level cannot be set to 30 the lens aperture may be incorrect. Readjust the lens aperture as explained in previous sections.

9. Press the Enter or Esc key when the adjustment is complete.
   Follow the messages displayed on the monitor, there is no machine data to be saved.

9.5.4. Adjusting the Line Array Camera Scale

The line array camera scale represents an actual measurement (in microns) equivalent to one pixel. This scale must be calibrated correctly for accurate recognition of components.

To calibrate the camera scale you will need a SOP of known size. When you execute the adjustment utility described below the scale is calibrated automatically and at the same time the XY positions and installation angle R of the line array camera 1 and 2 in the "Camera Coordinate" machine data are adjusted also.

Setting up for the line array camera

Before you begin the calibration, check the current camera scale settings and prepare the component and nozzle as described below:

1. Check the current settings of the camera scale
   - Select <3/2/A1 Select target/Vision parameter> and press <Enter>.
   - Check the settings of the Multi-cam 1 (or 2) scale. When you execute the "Multi-camera/camera scale" command explained later the X/Y values will be calibrated.

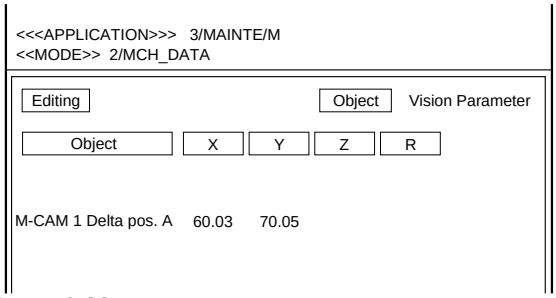


Figure 9-33

2. Prepare a component to be used as a reference.
   Use a relatively large popular QFP of known size which is registered in the component database. If you have no SOP available you can use chip capacitors such as a C2125 (if you use a component that is not registered in the database it must be registered).

3. Edit "search area mm" in the component data.
   Data registered in the database as a number larger than 500 cannot be edited due to write protection. Make a copy of the data as a number smaller than 500 and edit this data. Following is an example of this:
   - Open the Vision sub-window of the component registration No 6.
   - Edit the Search area parameter. Use the number key's to change the normal value to 9.99 (max setting). This is to enable off center pickup of the SOP to be performed later on.
   - Set the trayfeeder parameter in the User Item window to "Tray". The sub-window switches by pressing the F4 key.

4. Save the edited data, Press the "Esc" key twice, then select <C0 Save & Exit> and press the <Enter> key.

5. Press the emergency stop button and attach a nozzle to head 1.
   Attach a nozzle for SOP (type 32) to head 1.

6. Execute the adjust assistant to check that the component is recognized.
   For details on the adjust assistant refer to the user manual, if necessary increase the search area value.

Adjusting the line array camera scale

When the preparation is complete, adjust the scale of the line array camera with the procedure below.

1. Cancel the emergency stop.
   Ensure safety and release the emergency stop button and press <Ready> on the HHK.

2. Execute the "Multi camera" command
   - Select <3/3/B1 adjust target/ Multi-cam"> and press <Enter>.
   - Select "camera scale" and press <Enter>.
   - Select the camera to be adjusted and press <Enter>.

3. Confirm that "Distance (mm) 5" is displayed and press <Enter>.
   Normally a moving distance of 5mm is recommended.
4. Enter the component database No. and press the <Enter> key.

Enter the database no of the component you have prepared.

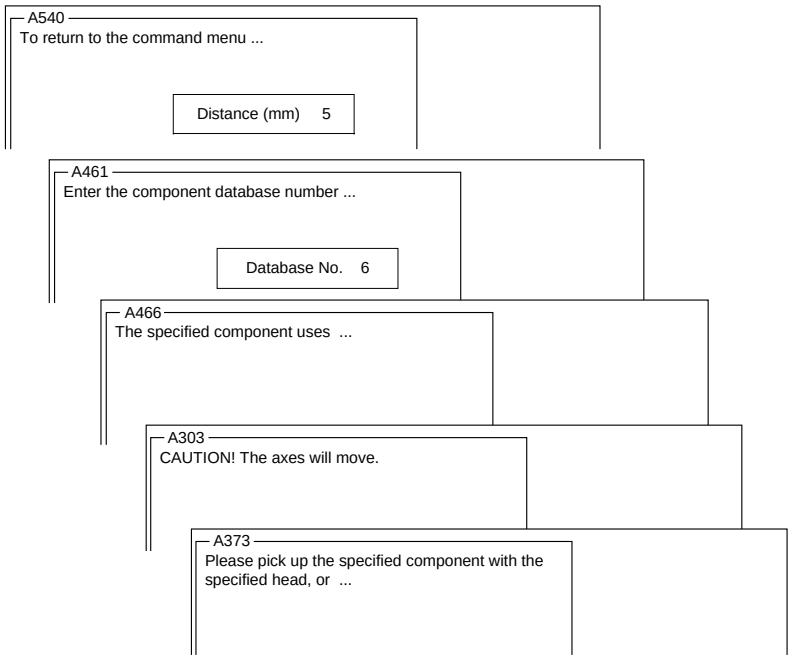


Figure 9-34

5. Ensure safety and press the <Enter> key twice.
   The head assembly moves to a point where head 1 is ready to pickup a component.

6. Press the emergency stop button, then attach the component to head 1.
   Attach the component to the nozzle of head 1, with the component center slightly shifted.

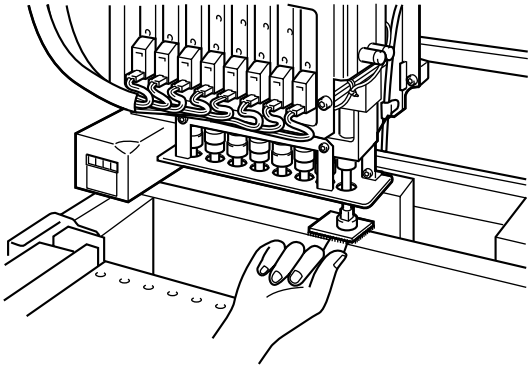


Figure 9-35

CAUTION

When using a SOP component, attach it to the nozzle with the component center slightly shifted. Align the long side parallel to the X-axis.

7. When the component has been attached, press the <Enter> key.

8. Cancel the emergency stop.
   Release the emergency stop button and press the <Ready> button of the HHK.

9. Ensure safety and press <Enter> again.
   The head assembly passes repeatedly over the line array camera and the camera scale is calibrated. The results are then displayed on the upper right of the operation monitor.

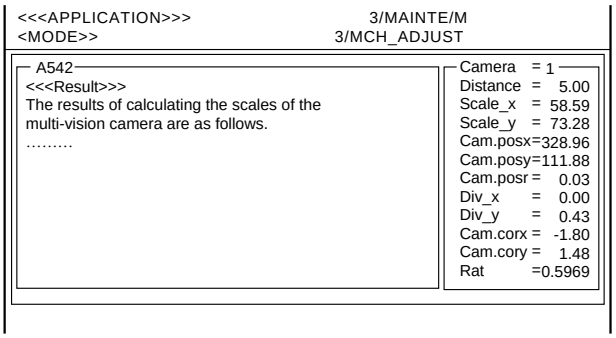


Figure 9-36

10. Press the <Enter> key to save the calibrated results.
    Press the <Esc> key if you want to cancel the results. Then proceed to the next step to calibrate the scale of the line array camera 2. When your machine is not equipped with a line array camera 2 advance to step 12.

11. Next calibrate the scale of the second (optional) line array camera.
    With the component still picked up by hand execute the “Multi Camera” command again as in step 2 and select “Multi Cam 2”.

NOTE: In case of two line array cameras the difference in Cam Co-ordinate X and Y parameters between the two cameras should be within “10”. If this difference exceeds “10” an error message window appears as shown below. The advise is to make fine adjustments to the installation of camera 2 as described below, the procedure to adjust the camera optical axis might also be very useful to check in this case, see the end of this chapter.

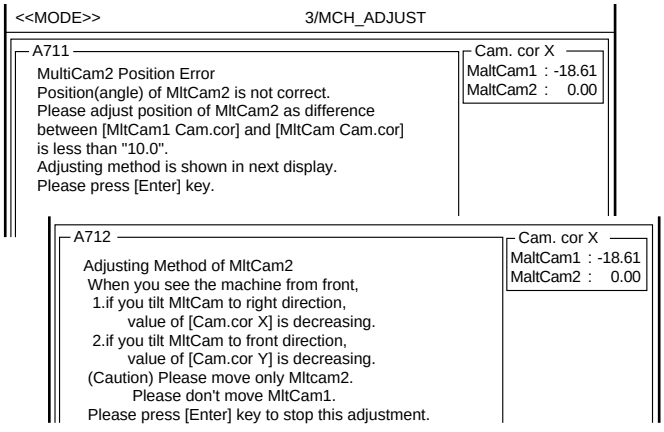
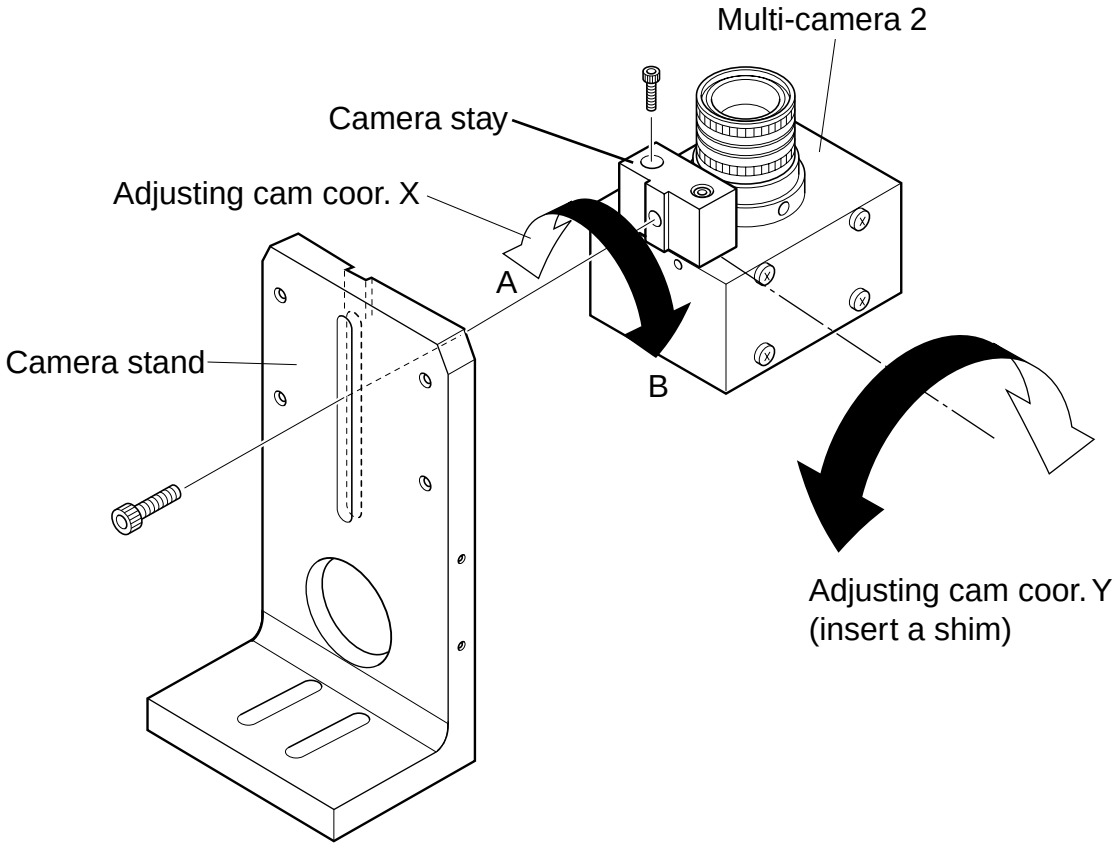

<<MODE>> 3/MCH_ADJUST
A711
MultiCam2 Position Error
Position(angle) of MltCam2 is not correct.
Please adjust position of MltCam2 as difference
between [MltCam1 Cam.cor] and [MltCam Cam.cor]
is less than "10.0".
Adjusting method is shown in next display.
Please press [Enter] key.
Cam. cor X
MaltCam1 : -18.61
MaltCam2 : 0.00
A712
Adjusting Method of MltCam2
When you see the machine from front,
1.if you tilt MltCam to right direction,
value of [Cam.cor X] is decreasing.
2.if you tilt MltCam to front direction,
value of [Cam.cor Y] is decreasing.
(Caution) Please move only Mltcam2.
Please don't move MltCam1.
Please press [Enter] key to stop this adjustment.
Cam. cor X
MaltCam1 : -18.61
MaltCam2 : 0.00

Figure 9-37

- To adjust the Cam coord. X loosen the bolt securing the camera stay to the camera stand, then make the fine adjustments to the camera installation angle. Retighten the bolt to secure the camera.
- To adjust the Cam.coord. Y loosen the bolts securing the camera stay and insert a shim (of 0.05mm) between the stay and camera. Then retighten the bolts to secure the camera. In either case adjust the camera installation in the A-direction when increasing the Cam coord. X,Y values and in B-direction when reducing them.

Figure 9-38



12. When the calibration is complete dump the component.
    Press the <Enter> key to dump the component automatically.
    If you want to quit without dumping, press the <Esc> key and follow the message on the operation monitor.

13. Save the calibrated data.
    Select <B2 Save data> or < B0 Save & Quit> and press the <Enter> key.
    (to quit without saving select B3 or B7)

14. Return the edited data to the original setting.
    Return the edited data to the original setting as nessecary. If you want to keep this edited data, it is advisable to enter a proper comment.

9.5.5. Adjusting the Dual Recognition Offset

The line array camera can recognize components travelling from left to right and right to left. This recognition offset between the both directions is indicated by the parameter "DualRec.Offset" in the position parameters and must be adjusted correctly for accurate mounting. It is recommended that you use a SOP such as those used in camera scale adjustment.

1. Attach an SOP to head 1
   Press the emergency button and attach an SOP nozzle (type 32) to head 1.

2. Cancel emergency
   Ensure safety and release the emergency button and press <Ready>.

3. Execute the Multi-camera utility
   - Select <3/3/B1 adjust target/multi-camera" and press the <Enter> key.
   - Select "Dual rec. Offset" and press the <Enter> key.
   - Select "Multi cam 1" and press <Enter>.
     If your machine is equipped with an optional multi-vision camera and you are making adjustments to it, select the correct camera number.

4. Enter the component database no and press <Enter>.
   Here enter the database number of the QFP you have prepared.

5. Ensure safety and press <Enter> twice.
   The head assembly moves to a point where head 1 is ready to pick up the component.

6. Press emergency an attach an SOP to head 1 by hand.
   When using a rectangular SOP, align the long side in parallel with the X-axis. When the SOP has been attached press <Enter>

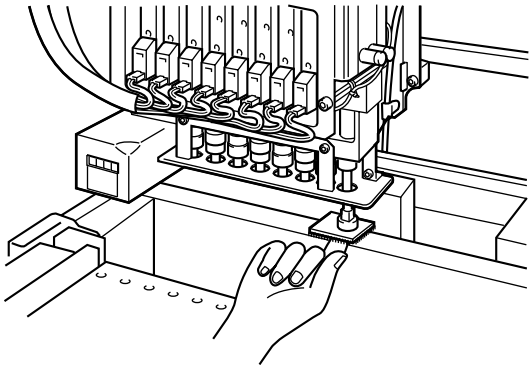


Figure 9-37

7. Cancel emergency
   Release the emergency button and press the <Ready> button on the hand held keyboard.

8. Ensure safety and press <Enter> again.
   The head assembly passes repeatedly over the multi-camera and the dual recognition offset is measured. The results are displayed in the upper right corner of the operation monitor.

9. Press <Enter> key to save the results.

Press <Esc> if you want to cancel the results.

10. When the measurement is complete dump the component

11. Save the results
Select <B2 Save data> or B0 Save and Quit> and press <Enter>
Quit without saving by means of B3 or B7.

9.5.6. Replacement of the Line Array Camera

When replacing a new line array camera into the system one should take care the camera is mounted correctly. Figure 9-38 shows the way the cameras should be mounted into the system seen from the front side of the system.

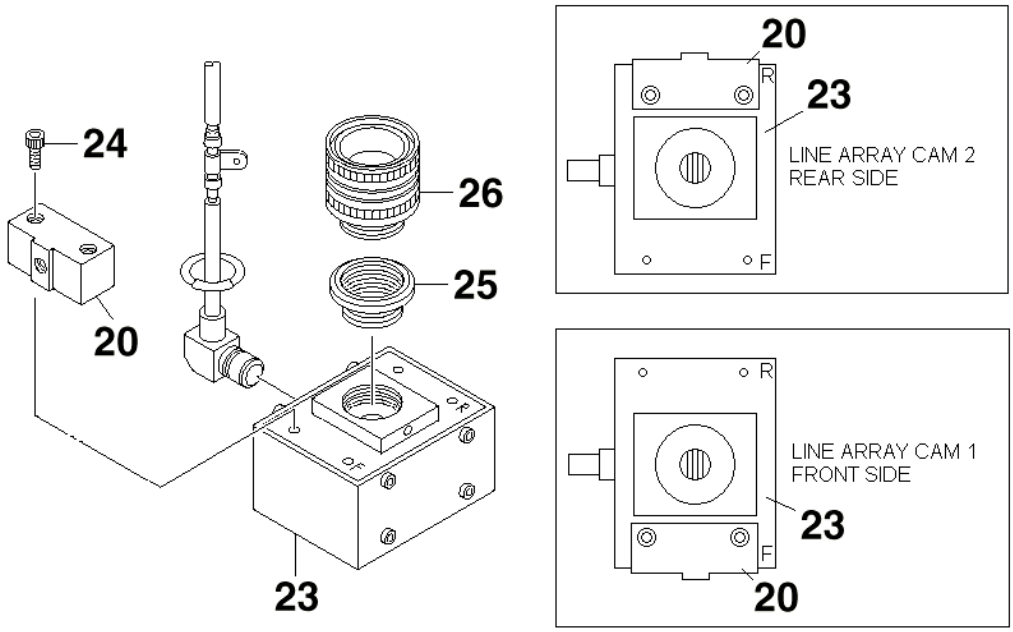


Figure 9-38 Multi-camera 1 and 2 positions

For both the front and rear line array camera the line array camera is the same. The difference is the way of mounting the bracket item 20 onto the camera. For the front line array camera (1) this is the position indicated with the “F” while item 20 should be mounted at position “R” for line array camera 2. The right side of figure 8-25 shows the exact mounting positions, note that both cameras are mounted with the camera cable pointing to the left.

In this way the rear side line array camera is rotated 180 degrees with respect to the front side line array camera.

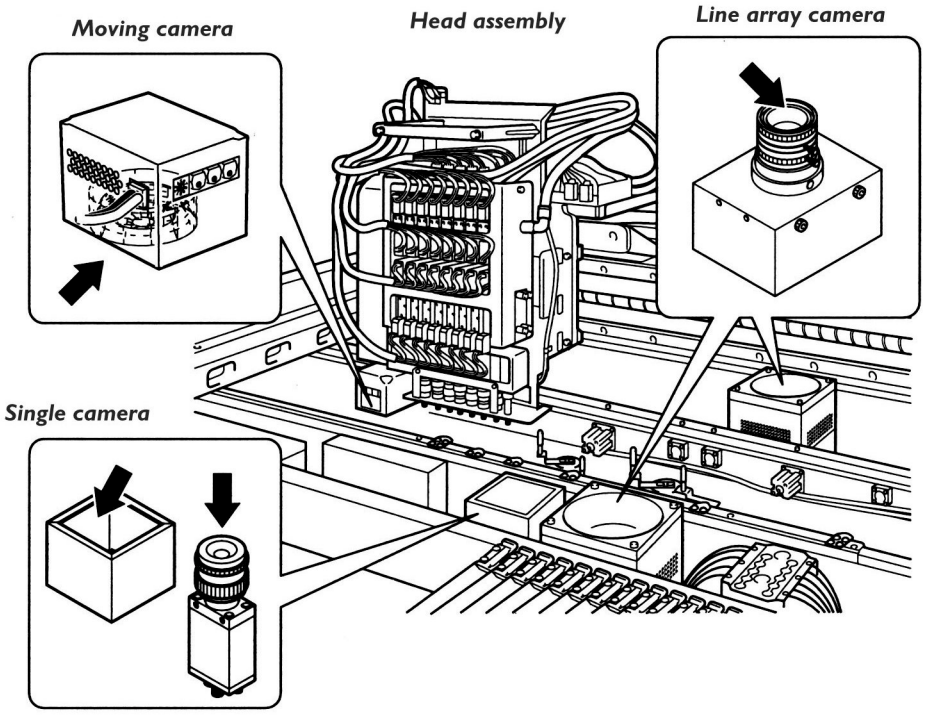
When installing a second camera into the system be sure to set the knurled ring of the complete lens in its middle position as this enables better adjustment.

9.6. Cleaning the Optical Systems

The optical systems of the Topaz must be cleaned periodically. When making adjustments to the camera's make sure to remove any dust and debris in advance.

To clean the optical systems use a cleaning stick supplied with the machine or cotton swab, slightly moistened with ethyl alcohol and wipe the surface of the lens. Do not use organic solvents for cleaning.

Figure 9-39



CAUTION

Do not apply excessive force to the cameras while cleaning, this may cause the calibration parameters to be unreliable.
Be sure to press emergency prior to cleaning !

9.7. Recognition Errors

This chapter describes some recognition errors that might occur.

9.7.1. Chip Components

Symptom	Possible cause	Corrective action
Recognition error frequently occurs with almost all components	Dust or dirt on the camera lens.	Whip the lens surface with its special cleaner.
Recognition error frequently occurs with specific components	The shape data in the component information width is not correct, or the nozzle is picking up the component by the edge.	Check the shape data and make adjustments by using the adjust assistant. If the pickup position is off center of the component check the tape feeder for operation.
Recognition error frequently occurs with a specific head, specific components cannot be recognized	The buffing part of the nozzle does not move smoothly, or dirt is on the nozzle tip. The shape data in the component information is not properly supplied.	Generate a negative pressure for all heads in the manual mode and move the nozzles. If any incorrect value is entered for the shape data the component is supplied in a wrong direction, this also results in recognition errors. For components to be supplied laterally specify 0 degree in the database. While specifying 90 degrees for lengthwise supply.

Table 9-3

9.7.2. QFP Components

Symptom	Possible cause	Corrective action
Recognition error frequently occurs.	Incorrect data is entered for the Component Information.	Check the data on the Component Information, and perform "PARAM. SEARCH" in the Adjust Assistant.
Recognition error frequently occurs. (QFP is not displayed on the vision monitor.)	If the component has deviated from the center of pickup position, it may shift from the center of the monitor, resulting in a recognition error.	Check the "Feeder Pos_X/Y" and "X/Y-CompPitch" values in the Component Information, and make the corrections.
Components cannot be recognized.	The direction supplying the component is not correct. (If the supply direction is wrong, the number of leads is switched between the length and width sides, causing a recognition error even if the SHAPE data is correct.)	Component supply data is created for the database, with the lateral supply as standard. Therefore, when the component is to be supplied in a lengthwise direction, enter "90 degrees (-90 degrees)" for the "Pick Angle" parameter in the Component Information.

Table 9-4

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CHAPTER 10 Software Section

10.1. Introduction

This chapter of the service manual describes issues related to the machine software (VIOS version **1.23)** and PCB software files. The installation and back-up procedures will be described and a list of all system messages will be given. Also a description how to deal with floppy/hard-disk problems will be given. The final part is an overview of system messages.

A basis knowledge of the DOS operating system is recommended.

MS-DOS is a trademark of Microsoft Corporation.

The above mentioned software packages may only be used in accordance with terms of the software License agreement.

10.2. System Software

10.2.1. Operating System

The DISK operating system which is used by the system is the **MS-DOS version 6.2**. The operating system is installed at the factory on the hard disk (drive C:) together with the VIOS software package.
The contents of the root directory of drive C: is listed in paragraph 10.2.2.

10.2.2. Disk Organization

The hard disk is basically organised as is shown below.

ROOT C:\	SUB-DIRECTORY s	EXPLAINATION
	DOS	Contains the standard DOS commands
	INS	Contains some utilities like MONITOR to adjust VIOS monitor
	KG7-42T0.012	Contains all machine parameter tables.
	KG7-42M0.012	Contains all text messages used in the VIOS screens
	P_BASE	The P-BASE is the European/USA database, it contains 4 HIDDEN files with the basic PCB-, component-marker-, and ID information's.
	D_BASE	The D_BASE is the Asian (Japanese) database and is not supported by Philips.
	NO0	Is used for the optimiser
	NO1	This directory is the Machine no.1 directory which contains data of the various action specs (mount programs) and the machine data: USER.HD and USER.ED files.
	RAMD	In this directory all temporary files are stored (hidden!)
	STATUS	In this directory a number of status files are stored
	SRVUTL	This directory contains a number of factory adjust and check programs
	RESULT	Some result files are stored here
	PGM	This directory is used to store the auto mount-feedback files
	TEMPLET	
	PRT	

PROGRAMS:	DESCRIPTION
Command.com	Dos command interpreter
INSTALL	Installation batch program
WINA20 386	DOS internal command
YDEV EXE	VIOS Device driver
UPDATE.BAT	Batch file needed at software update
DOS4GW.exe	Command interpreter
CONFIG.us	back-up config. file
CONFIG.sys	Start-up Configuration file
AUTOEXEC.us	back-up start-up file
AUTOEXEC.bat	Start-up file
MCXCONF.sys	VIOS configuration file
FIX2000.exe	Y2K patch
NCJ.ini	Ini file
LHA.EXE	Extract command file
LHA.DOC	Document description
SERIAL.STS	Status file
Ftable.bin	File table for the action specs (hidden)
KG2-42S0.005	Sequence Program IPL
KG2-42S7.005	Sequence program OS
KG2-42S8.00A	I/O communication software OS
KG2-42S9.005	I/O communication software IPL
KG7-44D0.237	VISION program (will be down-loaded during start-up)
KG7-44D1.237	VISION program
KJ0-58D9.044	
KM5-58D9.007	Servo program (will be down-loaded during start-up)
VIOS. EXE	Main VIOS executable program
CONVERT.exe	
BRAND.sys	Brand name selection

The files above are the most important files of the root directory of the system, which uses the MS-DOS 6.2 system.

10.2.3. Installation Disk Contents

With the system there will be a set of 5 diskettes supplied:

1. SYSTEM DISK 1
2. SYSTEM DISK 2
3. SYSTEM DISK 3
4. SYSTEM DATA
5. VIOS SOFTWARE UTILITY

The SYSTEM 1, 2 and 3 diskettes contain the VIOS program, utilities, component and mark database.
The VIOS SOFTWARE UTILITY disk contains various utilities of the machine.
The SYSTEM DATA disk contains a back up of the **MACHINE data, Static component database and Component / Mark database**
An example of the contents of the 5 floppies is shown in the next screens.

SYSTEM – 1

SM100	.001	1	07-23-97	07:33
INFDSK	.V12	381	11-29-95	12:06
INS1	.LZH	1.114.237	21-12-98	08:55

SYSTEM – 2

SM100	.002	1	07-23-97	07:33
INFDSK	.V12	56	11-29-95	12:05
INS2	.LZH	995.318	21-12-98	04:54

SYSTEM - 3

SM100	.003	1	07-23-97	07:33
INFDSK	.V12	56	11-29-95	12:05
INS3.	.LZH	781.441	21-12-98	04:55
VERSION	.STS	6	12-14-96	11:47

SYSTEM - DATA

NO0	**>SUB_DIR<**		98-06-17	15:58
NO1	**>SUB_DIR<**		98-06-17	15:58
FTABLE	.BIN	740	06-09-98	08:33
INFDSK	.V12	56	11-29-95	12:06
DATABASE	.LZH	29730	06-11-98	04:59
MCXCONF	.SYS	2110	05-29-98	01:10
SM100	.DAT	1	07-23-98	

VIOS SOFTWARE UTILITY DISK

Name	Ext	Size	Date	Time
INST486	LZH	333812	12-21-98	8:15p
UPDATE	BAT	478	11-04-98	8:19p
COMMAND	.COM	58886	12-06-93	6:20a
LHA	DOC	27059	7-20-91	2:13a
LHA	EXE	34445	7-20-91	2:13a
HDDCHK	EXE	113005	12-22-97	11:17a

Figure 10.1 Contents of installation disks

The SYSTEM DATA disk is very important because it contains the MACHINE PARAMETER files USER.ED and USER.HD in the No1. Directory. The **USER.ED** contains the **machine configuration (Equipment Data)** and the **USER.HD** all the **machine parameters (Hardware Data).** Another important file is the **DATABASE.LZH**. This file contains the compressed component and mark data

CAUTION

Before re-writing the software or hard disk always check if there is a system back up on disk. It is strongly recommended to make a back up via the VIOS SOFTWARE UTILITY immediate after the system is unpacked and set-up. Keep this back up on a safe place away from the machine.

The back up can be done via the VIOS SOFTWARE UTILITY See for this procedure paragraph 10.3.2 of this chapter.

The SYSTEM disks 1,2 and 3 containing the files INS1.LZH, INS2.LZH and INS3.LZH. which are compressed by means of the LHA command. These files are the complete VIOS operating system and database, which must be 'de-compressed' via the same LHA command. The UPDATE.bat and related files will take care of this extraction.

10.2.4. VIOS Software Utility

This section describes how to start-up the VIOS software utility for machines. As soon as the MS-DOS 6.2 system is loaded, the system will wait for 6 sec before continuing with the VIOS boot-up. During that period the following message is shown:

> Now Loading [VIOS SOFTWARE UTILITY].
> If you hit any key, [VIOS SOFTWARE UTILITY] will start.
> If you don't hit any key, this mode will finish after 6 sec and machine continues to start up.

If a key is pressed during these 6 seconds the system will go into the software utility screen. The following procedure has to be followed:

1. **Type in the password for level 8 after the message is displayed, and press the [Enter] key.**

2. **Use the up/down key to select the language and press [Enter].**

3. **Then the main menu of the VIOS Software Utility appears with the following selections:**

    1. Starting Up Machine
    2. VIOS Soft Version Up
    3. System Data Utility
    4. [VIOS SOFTWARE UTILITY] Installation
    5. Change of Protect Level
    6. Database Utility
    7. Production History Utility
    8. Disk Utility
    9. VIOS Special Command

These 9 selections will be discussed in the next paragraphs.

3.1 Starting Up Machine

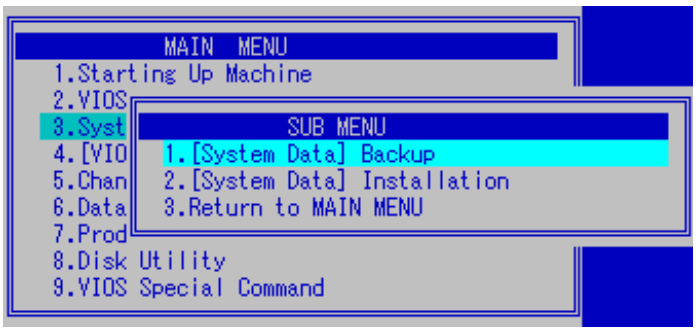
This command starts up the machine in the normal way.

Remark:
This command is only available for VIOS releases from V1.20 software onwards.

3.2 VIOS Software Version Up

This command execute the version up of VIOS/V1.2x software, using [SYSTEM-1 DISK] until [SYSTEM-3 DISK], see paragraph 10.2.5.

3.3 System Data Utility



[System Data] Backup

This command saves machine data into [SYSTEM-DATA DISK]. After the changing of option configuration/database/machine data/etc, use this command to save the newest information onto the floppy disk.

[System Data] Installation

This command executes the initial installation of VIOS/V1.2 for the machine, using [SYSTEM-DATA DISK].

CAUTION

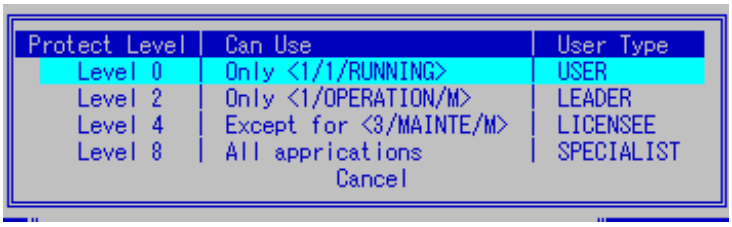
This command can be dangerous because it initialises all machine data on the hard disk. Use this command only in case the machine data is corrupted or out of date or if there are hard disk problems.

3.4 [VIOS SOFTWARE UTILITY] Installation

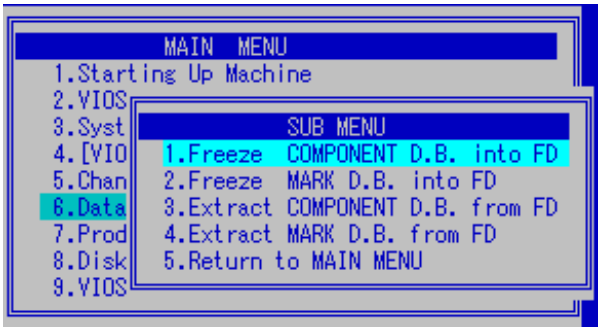
This command installs the [VIOS Software Utility] itself. Use this command for the version up of [VIOS Software Utility].

3.5 [Change of Protect Level]

The protection level is selectable using this command. The protection level limits the operation just after the starting up of the machine.



3.6 [Database Utility]



Freeze COMPONENT D.B. onto FD

This command saves the component database of the machine onto a floppy disk. Prepare a new floppy disk formatted as 1.44Mbyte for this purpose. Use this command to save and use the [Extract COMPONENT D.B. into FD] command to copy the database onto other machines.

Freeze MARK D.B. onto FD

This command saves the mark database of the machine onto a floppy disk. Prepare a new floppy disk formatted as 1.44Mbyte for this purpose. Use this command to save and use the [Extract MARK D.B. into FD] command to copy the database onto other machines.

Extract COMPONENT D.B. from FD

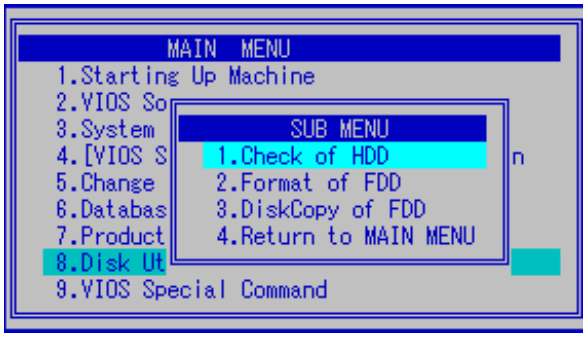
This command extracts the component database from the floppy disk to the hard disk. Use the floppy disk with the database data saved by [Freeze COMPONENT D.B. into FD].

Extract MARK D.B. from FD
This command extracts the mark database from the floppy disk to the hard disk. Use the floppy disk with the database data saved by [Freeze MARK D.B. into FD].

3.7 [Production History Utility]

Production History Utility is an optional function. This command is available only when this option is equipped for the machine.

3.8 [Disk Utility]

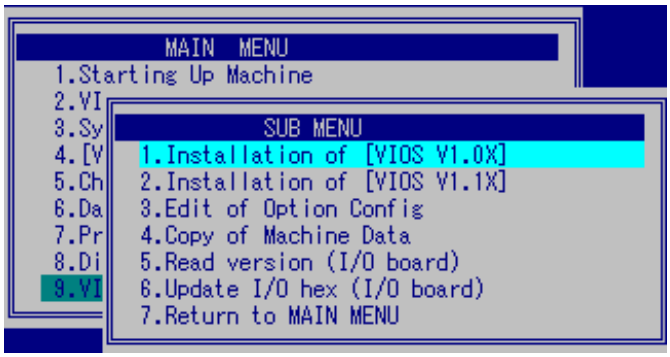


Check of HDD
This command calls the [SCANDISK] of MS-DOS. Use this command for the hard disk troubles. Also refer to the paragraph 10.2.10 in this chapter.

Format of FDD
This command calls [FORMAT] command of MS-DOS to format floppy disks.

Disk Copy of FDD
This command calls [DISKCOPY] command of MS-DOS to copy floppy disks.

3.9 [VIOS Special Command]



A) Installation of [VIOS V1.0X]

Use this command to install V1.0 onto a machine with V1.2x by following the next procedure:

1. Wait following messages appears on the display.

If you use this command, VIOS V1.2X will be deleted!!! If you want to execute this command, hit [Space] key. If you want to stop this command, hit other key.

2. Press [SPACE] key to execute the installation. Then the next message appears on the display.

OFF Turn off power switch.

3. Turn off the power switch and turn it on again, then [VIOS Software Utility] starts, and type in the password of level 8 according to the message.
4. Execute [2. Version up of VIOS] and install V1.0 following the procedure.
5. Although the machine works with V1.0X by next starting up, some machine data should be modified by manual operation as is shown in the Note below.

NOTE:

Just after these operations,

1. [Baud rate] in <RS-232C> in <3/2 MCH_DATA> may NOT BE CORRECT. Change the value into original condition if the communication functions are used.
2. Z value of [PCB/Fix.T.F.] in <Coordinate> in <3/2 MCH_DATA> may NOT BE CORRECT. Type in 0.00 into this data.

Wait point NORMAL 215.76 80.00 -4.50 0.00
Discard point NORMAL 215.76 80.00 30.00 1
PCB/Fix.TF 0.00 52.73
Marker height 0.00
Simul.pickarea 0.20 0.20 0.50 1.00

3. See <Confirmation after the version up> in <2.5.2 Version up of YVOS2>, and following to the description, confirm the values in [3/1/A3 FEEDER PLATE(BASE) INF], and [FEEDER PLATE OFFSET] in 3/2/A1 and so on.

B) Installation of [VIOS V1.1x]

Use this command to install V1.1x onto a machine with V1.2x by following the next procedure:

1. Wait following messages appears on the display.

   If you use this command, VIOS V1.2X will be deleted!!!
   If you want to execute this command, hit [Space] key.
   If you want to stop this command, hit other key.

2. Press [SPACE] key to execute the installation. Then the next message appears on the display.

   OFF
   Turn off power switch.

3. Turn off the power switch and turn on it again, then [VIOS Software Utility] starts, and type in the password of level 8 according to the message.
4. Execute [2. Version up of VIOS] and install V1.1 following the procedure.
5. Although the machine works with V1.1X by next starting up, some machine data should be modified with manual operation as shown in the note below.

NOTE:

Just after these operations check the following:

1. [Baud rate] in <RS-232C> in <3/2 MCH_DATA> may NOT BE CORRECT. Change the value into the original values if the communication functions are used.

C) Edit of Option Config

This command calls up the editor of <3/1/A1 OPTION CONFIG>. For example, if the Tray Changer (LCS) had been removed without changing the [Tray Changer] option into NON in <3/1/A1 OPTION CONFIG>, the machine will hang-up, until the [Tray Changer] option is changed into NON using this command.

D) Copy of Machine Data

This command installs the machine data using the [SYSTEM-DATA DISK].

CAUTION

This command is dangerous because the machine data is initialized. Use this command only when the hard disk in the machine has problems.

E) [**Read version (I/O board)**]
This command read the version of I/O board

F) **[Update I/O hex (I/O board)]**
This command installs software onto the I/O board. The command can only be used on system boards, which have a Flash memory (KM5 type).

CAUTION

Normally these 2 commands are not used. These commands requires the VIOS I/O BOARD UTILITY INSTALLATION DISK for its execution.

10.2.5. Installation of a New Version VIOS System Software

This paragraph describes how to upgrade your system software and how to make a back up.

CAUTION

Before any upgrade is executed, make sure you have a system software backup. Please refer to paragraph 10.2.4. After VIOS version V1.23 an automatic backup during the installation of new software will be made.

The following disks are required when upgrading the VIOS software to a higher level.

- SYSTEM - 1 DISK upgrade disk
- SYSTEM - 2 DISK upgrade disk
- SYSTEM - 3 DISK upgrade disk
- SOFTWARE UTILITY DISK (see remark in step 4)
- SYSTEM DATA DISK System data and backup disk

Proceed with the following actions:

Step 1 Shut down the VIOS software and turn off power (this for the monkeys among us).

Step 2 Switch on the machine and press a key within 6 sec. Now the "VIOS SOFTWARE UTILITY" will start.

Step 3 Enter the password of protection level 8 and the main menu of the "VIOS SOFTWARE UTILITY" will appear.

Step 4 Select “4” [VIOS software utility installation] and follow the instructions on the screen.

Remark: The steps 4-7 are only needed if the version-up contains a new version software utility disk but it is advised to do these steps always.

Step 5 Remove the VIOS software utility floppy out of the floppy drive and switch off power.

Step 6 Switch on the machine and press a key within 6 sec. Now the "VIOS SOFTWARE UTILITY" will start.

Step 7 Enter the password of protection level 8 and the main menu of the "VIOS SOFTWARE UTILITY" will appear.

Step 8 Select "2" Version up of VIOS soft and press the [ENTER] key. Follow the instructions on the screen.

- Insert a blank formatted disk in the floppy drive as the system will ask for it (to create a system data back up)
- Copy SYSTEM 1 DISK
- Copy SYSTEM 2 DISK
- Copy SYSTEM 3 DISK

Step 9 when the upgrade is completed, the following message will appear on the screen:

"Version up Finished successfully hit any key"

Step 10 Select "3" System Data utility and select [System data] backup, then press the [ENTER] key. Insert the "SYSTEM DATA DISK" in the floppy - drive and hit any key. Follow the instructions on the screen.

Step 11 Select "1" to start the VIOS software.

10.2.6. Backup Creation

It can be useful and save to make at regular times back-ups of the system data (f.i. after a recalibration or new component/mark data). From version V1.23 onwards, the installation procedure takes care of a back up before the new installation starts.

In order to make a back up of the machine data follow the next steps:

Step 1 Shut down the VIOS and turn off power.

Step 2 Turn on power and after a moment a screen will appear that the machine will start after 6 sec., press any key within 6 sec. after this message, to enter the "VIOS SOFTWARE UTILITY".

Step 3 Enter the password "specialist" and the main menu of the "VIOS SOFTWARE UTILITY" will appear.

Step 4 Select "3", 'System Data Utility' and hit the [ENTER] key

Step 5 Select "1" [system Data] backup and follow the instructions on the screen.

Step 6 When the backup is completed, the following message will appear on the screen "Backup data finished successfully. Hit any key"

Step 7 Remove the floppy disk from the drive, label it with the correct information (name, time stamp, machine type, etc. and store it away on a save place.

Step 8 Select "1" to start the VIOS software.

10.2.7. VIOS Configuration

The VIOS configuration file is located in the ROOT directory on the C drive and is called MCXCONF.SYS.
This file (see fig 10.2.6) is very important for the VIOS system. If not OK, the VIOS software will not start up.

```
/REM+--------------------------------------+
/REM|   FILE:   MCX-CONFIGRATION           |
/REM|   TYPE:   120-YV100                  |
/REM+--------------------------------------+
/REM
/REM+--------------------------------------+
/REM|   TITLE:  ROM                        |
/REM+--------------------------------------+
/ROM:SYS=KG2-M42R9-002/*SYS bd.(BIOS+DRDOS)*/
/ROM:HED=KG7-M45R9-000/*IO  bd.(head)      */
/ROM:CNV=KG2-M45R9-002/*IO  bd.(conveyor)  */
/ROM:P&P=KG2-M45R9-002/*IO  bd.(YTF100)    */
/ROM:YPU=KG2-M51R9-003/*YPU                */
/REM+--------------------------------------+
/REM|   TITLE:  SOFT                       |
/REM+--------------------------------------+
/S:EXE=KM1-42E0-012   /*MAIN     ExeFile//KG7R.EXE    */
/S:TYP=KG2-42T0.012\\ /*MCH TYPE TxtFile//TYPE\*.*    */
/S:MSG=KG2-42M0.012\\ /*MESSAGES TxtFile//TEXT\*.TXT  */
/S:VAL=KG7-44D0.237   /*VISION   HexFile//TMSLIBIN.OUT*/
/S:IPL=KG2-42S8.00A   /*IO-OS    BinFile//8344OS.BIN  */
/S:IOS=KG2-42S9.005   /*IO-IPL   HexFile//8344IPL.HEX */
/S:APL=KM5-42S8.001   /*IO       HexFile//OS&IPL.HEX  */
/S:MC1=KG2-58D9.044   /*SERVO    HexFile//SRV.HEX     */
/S:MC2=KJ0-58D9.044   /*SERVO    HexFile//SRV.HEX     */
/S:MC3=KM5-58D9.007   /*SERVO    HexFile//SRV.HEX     */
/REM+--------------------------------------+
/REM|   TITLE:  ENVIRONMENT                |
/REM+--------------------------------------+
/H                    /*User sub directry*/
/WRAMD\               /*Work sub directry*/
/REM+--------------------------------------+
/REM|   TITLE:  OPTION SWITCHES            |
/REM+--------------------------------------+
/Dsleep  /*SLEEP(NoServo)/ACTIVE(WithServo)/EMUL(Emulate)        */
/Vsleep  /*SLEEP(NoVision)/ACTIVE(WithVision)                    */
/Isleep  /*SLEEP(NoIOcard)/ACTIVE(WithIOcard)/PART(OnlyBasicIO)  */
/Csleep  /*SLEEP(NoCOM1)/ACTIVE(WithCOM1)                        */
/Ysleep  /*SLEEP(Fixed)/ACTIVE(Variable)                         */
/P0      /*Bit0=SkipBackupCheck: Bit1=WithDRDOS: Bit2=QuickStart */
/L8      /*Protrction 0(RUNNING)/2(OPERATION)/4(MAINTE),L8(ALL)  */
/A0
/J0
/XC7000
/XD2
```

Figure 10.2.6 MCXCONF.sys

10.2.8. Floppy Disk Problems

The floppy drive inside the Topaz is a standard 3.5", 1.4Mbyte floppy drive which uses the standard IBM formatted 3.5" diskettes (720Kbytes or 1.4Mbytes).

If the VIOS system has problems when reading from or writing to the floppy drive, perform the following actions:

- Check the floppy diskette by checking it at another PC (can it be read and/or written).
- If the diskette is OK at the PC, format the floppy diskette on the Topaz system and check if this is OK. Then try to write/read to/from the diskette.
- If it is still not possible to read or write, check the connections to the drive and check the 5 and 12V power.
- Swap the floppy drive if the connections and voltages are OK.

10.2.9. Flash Disk Problems (Only for Systems with KM5 System Boards)

Systems delivered after November 1998 are equipped with the new system board, which do not have a hard disk anymore. These systems are equipped with a so-called FLASH disk, which is mounted onto the SYSTEM PCB. The disk is treated as a normal IDE drive of 40 Mb. It is also possible to have 85 Mb disks installed. The disk when ordering at PCS (Philips EMT warehouse) are normally already formatted with the MS-DOS6.2 system.

This means that no installation of the DOS system is needed when ordering the 12 NC. Code number.
If there are problems with the disk, use the same procedures as described for the hard disk to check, format and install the MS-DOS and the Application software. The only difference is the way to enter the BIOS set-up. This can be done by pressing the [F10] key. After doing so, locate the boot disk selection and change it manually from C: to A:. Remember to set it back after the action is completed. To install the new MS-DOS 6.2 system, insert the 'hard disk maintenance disk No. 1' in the floppy drive and reboot the system. Continue with step 3 in section 10.2.10.

Remark: It is NOT possible to use both Flash and Hard disk at the same time, this because the 80486DX-4/100MHz card-PC does not allow both disks simultaneous. For this reason there is not HD connector available on the new system board.

The flash disk can be removed very easy from front of the MCX controller. Never do this while power is on. Also take care of the correct position when inserting the disk. There are two positions to support 2 flash disks. Drive C: is the one in the left slot (slot 1) while drive D: is the one in the right slot (slot 2), seen from the front.

Remark: Drive D: cannot be accessed by VIOS PCB handling, only the SHELL manager can handle this drive (useful to make back-ups.)

As already said, use the procedures mentioned in paragraph 10.2.10 to solve problems or to version-up VIOS releases.

10.2.10. Hard Disk Problems

In case there are problems with the hard disk, the following actions can be done to locate the problem cause.

- Check the 5V and 12V power supply's inside the MCX box.
- Check if the disk is addressed by the system during booting of the VIOS (LED at the front of the system PCB).
- If it is still possible to address the disk, check the disk by means of the software utility command (selection 7, in paragraph 10.2.2). The Scan-disk command will check and, if possible, repair the corrupted disk files.
- If the disk cannot be addressed any more, check the harnesses from disk to system board and the power cables.
- If it is needed to replace the disk, (or to re-format the existing disk), then it is needed to reinstall the complete MS-DOS and VIOS system again. Perform the following procedure to do this.

Make sure to have the following materials at hand before continuing:

1 Hard disk maintenance disks for 80486 system board (disks 1-6 order no. 5322-901-10003)
2 VIOS SOFTWARE UTILITY disk
3 Installation disk SYSTEM 1 (latest SW. version)
4 Installation disk SYSTEM 2 (latest SW. version) — 5322 901 10018
5 Installation disk SYSTEM 3 (latest SW. version)
6 Installation disk SYSTEM DATA (delivered
7 with the machine with the latest machine data back up)
7 Back up disks (to copy the PCB data)
8 Hard disk (if needed)
9 ESD protection kit.

CAUTION

The following steps have to be followed in the same order as described below. **Do not follow a different order.**

1 Replace the hard disk if necessary. (use ESD protection)

2 Change boot sequence

In order to access the floppy drive at boot-up a change of the boot-sequence (normally always from C:) must be done. For this the BIOS setting has to be changed. Carry out the following action:

a) Turn on power, and during boot-up, press and hold 'del' key. (Enter password: kj0m42)
b) Select 'advanced CMOS set up' and press [enter]
c) Press any key.
d) Change system boot-up sequence from C: A:, to A: C: by using [FUNC]+[Pgup] / [Pgdwn].
e) Insert hard disk maintenance disk no.1 in the floppy drive.
f) Esc, and press F10 to save and exit.
g) The system asks: "Write to Cmos and exit (y/n)". Answer "y" [enter]
Now the system will boot up from floppy disk.

3 Installation of MS-DOS/V 6.2 operating system and the Application software VIOS.

To install a new MS-DOS/V 6.2 operating system and other utilities proceed with the next steps.

The MS-DOS/V6.2 system will be covered by the sections (3.1 -- 3.5) while the Application software installation is covered by step 3.6.

REMARK:
Only in case of the complete installation (i.e. with a new hard-disk or reformatted disk) it is needed to follow the sequence as is given below:

3.1 Select "DELETE HARDDISK CONFIGURATION' press [ENTER]
(the partition on the hard-disk will be deleted)

a) press any key to continue.
b) type '**3**' and press [enter]
c) type '**1**' and press [enter]
d) type '**1**' and press [enter]
e) enter volume label. (the same name as seen on the screen)
f) press [enter]
g) are you sure '**Y**' [enter]
h) Esc.- Esc.- press any key when ready.
i) the system will restart.
j) press any key to continue.

3.2 Select "DEFINE HARDDISK CONFIGURATION" Press [ENTER]
(make a new partition on the hard-disk)

a) press any key to continue.
b) type '**1**' and press [enter]
c) type '**1**' and press [enter]
d) type '**Y**' and press [enter]
e) the system will restart after pressing any key.
f) press any key to continue.

3.3 Select "FORMAT HARDDISK" press [ENTER]
(the C:\ drive will be formatted)

a) press any key.
b) ALL DATA DRIVE C:\ WILL BE LOST.
c) input '**Y**' and press [enter]
d) enter volume label: **MS-DOS_6**

3.4 Select "INVESTIGATE PROBLEMS ON HARDDISK" Press [ENTER]
This starts up the 'scan disk' program which checks the complete hard-disk. Only in case there are problems this command is needed.

3.5 Select "COPY MS DOS 6.2 INTO HARDDISK" Press [Enter]
(MS DOS/V 6.2 will be copied into the hard-disk)

a) insert HARDDISK MAINTENANCE disk no.2, press any key to continue.
b) insert HARDDISK MAINTENANCE disk no.3, press any key to continue.
c) insert HARDDISK MAINTENANCE disk no.4, press any key to continue.
d) insert HARDDISK MAINTENANCE disk no.5, press any key to continue.
e) insert HARDDISK MAINTENANCE disk no.6, press any key to continue.
f) insert HARDDISK MAINTENANCE disk no.1, press any key to continue.
Now the files will be extracted.
g) Press any key to continue and to terminate the utility.

3.6 Proceed with the next steps to install the Application software (=VIOS) on the hard disk:

a) Turn off power, and remove the floppy disk.
b) Turn on power, and during boot-up, press and hold the **'del'** key, if the system ask for the password type in :kj0m42
c) Select 'advanced CMOS setup' and press [enter]
d) Press any key.
e) Change system boot-up sequence from A: C:, to C: A: by using [ctrl] [Pgup] / [Pgdwn].
f) remove floppy disk.
g) Esc., and press F10 to save and exit.
h) System asks: "Write to CMOS and exit (y/n)". Answer "y" [enter]
i) Turn off power.
j) Turn on power. And after boot-up the screen will show the C: prompt.
k) Insert the VIOS SOFTWARE UTILITY disk into the floppy drive
l) At the C:\ prompt type: **A:UPDATE** and press the [ENTER] key
m) After copying some files the message "turn off power" will be displayed. Turn off power and remove the floppy disk from the drive.
n) Turn on power, and after loading DOS a message will appear on the screen (for 6 sec.) "Please input password and hit the [ENTER] key". Enter "specialist" and press the [ENTER] key.
o) Select 2 "VIOS Soft version up" and press the [ENTER] key.
p) Follow the instructions on the screen:

- Copy SYSTEM 1 DISK
- Copy SYSTEM 2 DISK
- Copy SYSTEM 3 DISK

q) Select 3 "System Data utility" and select [System Data] installation.
r) Insert the SYSTEM DATA DISK, which contains the latest machine data for that machine, into the floppy drive and press [Enter] key
s) After copying of the machine data files is finished, remove the floppy disk
t) Select 1 'starting up machine' and press the [Enter key]. The system will now start up the VIOS system.

10.3. PCB File Handling

This chapter describes the issues related to the PCB files of VIOS.

In the [4/SHELL/M][DATA_FILE_MNG], the PCB files on the disk are shown. See figure 3.3.1a. The file name descriptions are stored in a hidden file named **FTABLE.BIN.** The names that can be given to each PCB may consist of 20 consecutive characters (no spacing).

```
                DATA[non                ]
<<<APPLICATION>>> 1/OPERATION/M  2/DATA/M  3/MAINTE/M  4/SHELL/M  0/EXIT
<<MODE>> 1/DATA_FILE_MNG  2/DISK_MAINTENANCE  3/VIOS_DIC  0/EXIT

<VIOS PCB> /Drv:C                       <VIOS PCB> /Drv:C
Vios Pcb Name          Date   Time      Vios Pcb Name          Date   Time

STATIC_COMPONENTS___ 94-07-16 07:58      STATIC_COMPONENTS___ 94-07-16 07:58
CONVEYOR              93-12-06 11:04     CONVEYOR              93-12-06 11:04
ANC_TEST              94-02-12 10:01     ANC_TEST              94-02-12 10:01
PALLET_80             94-02-12 09:25     PALLET_80             94-02-12 09:25
ADJUST_CHIP           95-08-11 13:46     ADJUST_CHIP           95-08-11 13:46
OFFSET                95-08-11 13:47     OFFSET                95-08-11 13:47
CUK_92001_1           94-01-10 18:05     CUK_92001_1           94-01-10 18:05
CUK_93001_0           94-02-12 09:18     CUK_93001_0           94-02-12 09:18
ECLIPSE               95-08-11 13:48     ECLIPSE               95-08-11 13:48
MFB_CHIP              95-08-09 13:38     MFB_CHIP              95-08-09 13:38
```

Figure 10.3 PCB file names

```
                DATA[non                ]
<<<APPLICATION>>> 1/OPERATION/M  2/DATA/M  3/MAINTE/M  4/SHELL/M  0/EXIT
<<MODE>> 1/DATA_FILE_MNG  2/DISK_MAINTENANCE  3/VIOS_DIC  0/EXIT

DIRECTORY C:\ECL92                      DIRECTORY C:\ECL92
Name   Ext    Size     Date   Time      Name   Ext    Size     Date   Time

..           >SUB_DIR< 96-02-26 15:15   STATUS       >SUB_DIR< 96-02-26 15:16
D_BASE       >SUB_DIR< 96-02-26 15:16   KG2-42M0 009 >SUB_DIR< 96-02-26 15:16
FONT         >SUB_DIR< 96-02-26 15:16   KG2-42T0 009 >SUB_DIR< 96-02-26 15:16
INS          >SUB_DIR< 96-02-26 15:16   KG2-42S9 005       476 93-03-06 08:57
NO0          >SUB_DIR< 96-02-26 15:16   KG2-42S8 007      8191 95-05-24 12:10
NO1          >SUB_DIR< 96-02-26 15:16   KG2-58D9 010     46706 95-05-12 12:11
PGM          >SUB_DIR< 96-02-26 15:16   KG7-44D0 146    555410 95-11-08 18:09
P_BASE       >SUB_DIR< 96-02-26 15:16   KG7-44D1 146      1082 95-02-17 17:11
RAMD         >SUB_DIR< 96-02-26 15:16   AUTOEXEC BAT        97 96-02-26 15:36
STATUS       >SUB_DIR< 96-02-26 15:16   FTABLE   BIN       308 95-09-06 19:07
KG2-42M0 009 >SUB_DIR< 96-02-26 15:16   ECL92    EXE   1584018 95-11-09 14:58
KG2-42T0 009 >SUB_DIR< 96-02-26 15:16   COM92    ICO      4026 96-02-26 15:23
KG2-42S9 005       476 93-03-06 08:57   ECL92    ICO      4026 96-02-26 15:30
KG2-42S8 007      8191 95-05-24 12:10   MCXCONF  NEW      2499 95-11-08 20:37
KG2-58D9 010     46706 95-05-12 12:11   SERIAL   STS       785 92-09-19 10:51
KG7-44D0 146    555410 95-11-08 18:09   MCXCONF  SYS      2493 95-12-18 16:16
```

Figure 10.4 Dos files

The C:\NO1 directory, first of all has the two following files:

USER.ED ; All Machine equipment (OPTION_CFG)
USER.HD ; All Machine parameters (MCH_DATA)

A backup of these files on the "SYSTEM DATA DISK" should always be present in the neighbourhood of the machine. See figure10.5.

```
                          DATA[non                ]
<<<APPLICATION>>> 1/OPERATION/M  2/DATA/M  3/MAINTE/M  4/SHELL/M  0/EXIT
<<MODE>> 1/DATA_FILE_MNG  2/DISK MAINTENANCE  3/VIOS_DIC  0/EXIT

DIRECTORY C:\orn\NO1                    DIRECTORY C:\orn
Name   Ext    Size     Date   Time      Name   Ext    Size     Date   Time

..           >SUB_DIR< 96-02-26 15:16   ..           >SUB_DIR< 96-02-26 15:15
@00101   BD       1000 93-09-24 09:53   D_BASE       >SUB_DIR< 96-02-26 15:16
@00201   BD       1050 93-12-06 11:04   FONT         >SUB_DIR< 96-02-26 15:16
@00901  *BD      19450 94-10-18 17:35   INS          >SUB_DIR< 96-02-26 15:16
USER     ED        152 95-12-18 15:54   NO0          >SUB_DIR< 96-02-26 15:16
@00101   FD          0 93-09-24 10:23   NO1          >SUB_DIR< 96-02-26 15:16
@00201   FD          0 93-12-06 11:04   PGM          >SUB_DIR< 96-02-26 15:16
@00901  *FD      57036 95-08-11 13:48   P_BASE       >SUB_DIR< 96-02-26 15:16
USER     HD      11800 95-12-08 15:09   RAMD         >SUB_DIR< 96-02-26 15:16
@00101   ID          0 93-09-24 11:29   STATUS       >SUB_DIR< 96-02-26 15:16
@00901  *PD       4257 94-07-16 07:58   KG2-42M0 009 >SUB_DIR< 96-02-26 15:16
@00201   ID        152 93-12-06 11:04   KG2-42T0 009 >SUB_DIR< 96-02-26 15:16
@00901  *ID        152 94-09-22 11:20   KG2-42S9 005       476 93-03-06 08:57
@00101   MD          0 93-09-24 10:23   KG2-42S8 007      8191 95-05-24 12:10
@00201   MD          0 93-12-06 11:04   KG2-58D9 010     46706 95-05-12 12:11
@00901  *MD        130 94-09-22 11:41   KG7-44D0 146    555410 95-11-08 18:09
```

Figure 10.5

```
          DATA[non                ]
<<<APPLICATION>>> 1/OPERATION/M  2/DATA/M  3/MAINTE/M  4/SHELL/M  0/EXIT
<<MODE>> 1/DATA_FILE_MNG  2/DISK MAINTENANCE  3/VIOS_DIC  0/EXIT

DIRECTORY C:\orn\NO1                    DIRECTORY C:\orn
Name   Ext    Size     Date   Time      Name   Ext    Size     Date   Time

..           >SUB_DIR< 96-02-26 15:16   ..           >SUB_DIR< 96-02-26 15:15
@00101   BD       1000 93-09-24 09:53   D_BASE       >SUB_DIR< 96-02-26 15:16
@00201   BD       1050 93-12-06 11:04   FONT         >SUB_DIR< 96-02-26 15:16
@00901  *BD      19450 94-10-18 17:35   INS          >SUB_DIR< 96-02-26 15:16
USER     ED        152 95-12-18 15:54   NO0          >SUB_DIR< 96-02-26 15:16
@00101   FD          0 93-09-24 10:23   NO1          >SUB_DIR< 96-02-26 15:16
@00201   FD          0 93-12-06 11:04   PGM          >SUB_DIR< 96-02-26 15:16
@00901  *FD      57036 95-08-11 13:48   P_BASE       >SUB_DIR< 96-02-26 15:16
USER     HD      11800 95-12-08 15:09   RAMD         >SUB_DIR< 96-02-26 15:16
@00101   ID          0 93-09-24 11:29   STATUS       >SUB_DIR< 96-02-26 15:16
@00901  *PD       4257 94-07-16 07:58   KG2-42M0 009 >SUB_DIR< 96-02-26 15:16
@00201   ID        152 93-12-06 11:04   KG2-42T0 009 >SUB_DIR< 96-02-26 15:16
@00901  *ID        152 94-09-22 11:20   KG2-42S9 005       476 93-03-06 08:57
@00101   MD          0 93-09-24 10:23   KG2-42S8 007      8191 95-05-24 12:10
@00201   MD          0 93-12-06 11:04   KG2-58D9 010     46706 95-05-12 12:11
@00901  *MD        130 94-09-22 11:41   KG7-44D0 146    555410 95-11-08 18:09
```

Figure 10.6.

In the same C:\NO1 directory, combination of files can be found that, they together form data of one PCB. Those files are:

@[FILE].**ID**	;	Contains the PCB name and run condition
@[FILE].**BD**	;	Contains the PCB mount data
@[FILE].**FD**	;	Contains the component and vision info.
@[FILE].**MD**	;	Contains all Mark information
@[FILE].**PD**	;	Contains the production history.

An example is shown in figure 10.6

10.4. Machine Configuration

The machine configuration list is located in the application MAINTENANCE MANAGER. A1 OPTION CONFIG Depending on the configuration of the system it is possible to disable or enable parts and options of the machine. (see fig.10.7.)

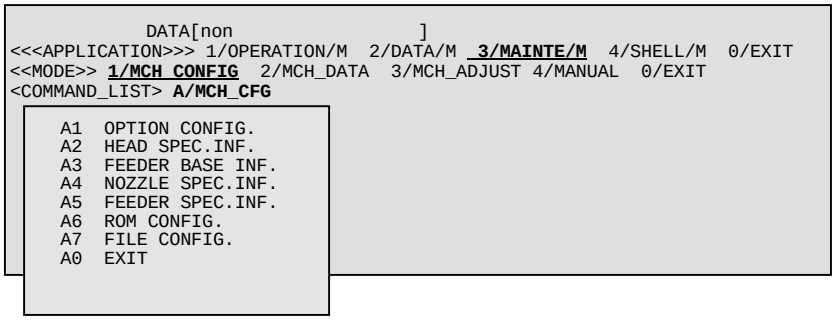


Figure 10.7 Maintenance manager

In figure 10.8 the machine configurations is shown of the VIOS V1.2x version. There are a number of options and features that are not used in the Topaz. (REMARK: the VIOS operating system is also used in other mounters).

By means of the INS and DEL key it is possible to enable or disable a certain option.

```
--------------------------DATA[non               ]--------------------------
 <<<APPLICATION>>> 1/OPERATION/M  2/DATA/M  3/MAINTE/M  4/SHELL/M  0/EXIT
 <<MODE>> 1/MCH_CONFIG  2/MCH_DATA  3/MCH_ADJUST 4/MANUAL  0/EXIT
+------------------------------------------------------------------------------+
¦OPTION CONFIG.                                                                ¦
¦          Serial:KM1-632312      M.type:SM100-1/2                             ¦
¦                                                                              ¦
•
•      /BASIC CONF./  Message                    English
•                     Simple Edition             Full Itms                     •
•                     RS232C CMU                 Normal                        •
•                     Sub Machine Type           SM100-2                       •
•      /SOFTWARE/     Online Optimization        None                          •
•                     Badmark Function           Normal                        •
•                     Badmark Distinction        Normal                        •
•                     Air Consumption            No Limit.                     •
•                     Alternate Component        WithConfirm.                  •
•                     Retry Sequence             GroupRetry                    •
•                     Production Log             Use                           •
•      /RECOGNITION/  Laser Alignment            Exist                         •
•                     Camera Combination         1&2:Single View               •
•                     Camera1 Spec.              Fore&Back Light               •
•                     Camera2 Spec.              Fore&Back Light               •
•                   • Camera3 Spec.              Fore&Back Light               •
•                     Multi Detection            Standard                      •
•                     MarkLightingControl        Exist                         •
•      /CONVEYOR/     Edge Clamp                 Exist                         •
•                     Conveyor Width Axis        Normal                        •
•                     Conveyor Direction         R -> L                        •
•                     Conveyor Spec.             Line                          •
•                     Conveyor Width             Exist                         •
•                     Precede Pick               None                          •
•      /BUFFER CONV/  Buffer Conveyor            A-TYPE                        •
•                     Buffer Conv. W Axis        Reverse                       •
•      /TRAY CHANGE/  Tray Changer               Ext.TC-A                      •
•                     Ext.TC Trv. Axis           Normal                        •
•                   • Ext.TC Access Table        A table                       •
•      /OPTIONS/      Nozzle Changer             Exist                         •
•                     Slide Feeder Bar           None                          •
•                     Co-Planarity Sensor        None                          •
•                     Dump Station               None                          •
•                     Dispense Head              None                          •
•                     Disp. Head R Sensor        Single                        •
•                     Dot Station                None                          •
•                     RS232C extension           None                          •
•••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••••
```

Figure 10.8 Configuration settings VIOS version V1.2x

10.4.1. Machine Configuration Detailed

Default selections are marked with an asterisk, if no default is defined, then the setting depends on the machine configuration (more choices applicable in that case). Some differences can noticed between both VIOS versions (indicated where needed).

Machine config: /BASIC CONF./

Parameter	Selection	Description
1. Message	Japanese	Not English
	English *	Not Japanese
		special other language (do not select if special language is not installed)
2. Simple Edition	Primal Items	Some component parameters are not shown
	Full Items *	All component information is shown
3. RS232C CMU	Ignore	No communication
	Normal	Standard communication
	WithCMU Report	As with 'Normal' but condition reports are send as well. (for PCS software)
4 Sub Mach Type	**SM100-II**	**For Topaz**
	SM100-IISP	For SIMM topaz

Machine config: /SOFTWARE/

1. Online Optimize	Exist	Simple optimiser during running
	None	No optimizer used during running
2. Badmark function	Normal	Normal use of badmark Transmit CMU) To transmit to a external PC for data sharing via a RS232 cable.
3. Badmark Distinction	Normal Reverse	Determines the Badmark usage
4. Air Consumption	No limit	Only Orion, Topaz and Comet
	Limited	Only Orion, Topaz and Comet
5. Alternate Component	WithConfirm WithEmpthyMes Continue	Determines the function of Alt.Comp **(only VIOS version >V1.xx)**
6. Retry Sequence	ReworkCycle GroupRetry SkipRetry	Determines the function of the retry action

Parameter	Selection	Description
7. Production Log	Use None	Records the machine logging and errors during running (Version 1.xx)

Machine config: /RECOGNITION/

1. Laser Alignment	**None***	
	Exist	Do not select
2. Camera Combin	1: Single view	Do not select
	1&2:Single view	Do not select
	1,2&3: Single view	Do not select
	1: Single, 3:Multi	Do not select
	3: Multi view*	Possible for Topaz
	1&2:Single, 3:Multi	Do not select
	2&3: Multi	Possible for Topaz
	1:Single,2&3:Multi	Possible for Topaz
4.Camera1Spec.	Back light	Camera 1 is a backlight type camera
	Fore light*	Camera 1 is a reflective type camera
	For&back light	Camera 1 can handle both
5. Camera2Spec.	Back light	Camera 2 is a backlight type camera
	Fore light*	Camera 2 is a reflective type camera
	fore&back light	Camera 2 can handle both
6. Camera3Spec.	Back light	Camera 3 is a backlight type camera
	Fore light*	Camera 3 is a reflective type camera
	fore&back	light Camera 3 can handle both
7. Multi-Detection	With Calib	In FINE mode placements, spindle expenditure is included in the correction algorithm (Remark: decreases system output).
	Standard*	Standard vision.
	Adjust mode1	Only for factory and calibration use
	Adjust mode 2	Only for factory and calibration use
8. **MarkLightingControl**	**None**	Fiducial lighting control
	Exist	

Machine config: /CONVEYOR/

1. Edge Clamp	**Exist** *	This option is always available
	None	Do not select
2. Conveyor Width Axis	**Exist** *	Automatic width exists
	None	Do not select

Parameter	Selection	Description
3.Conveyor Direction	**L -> R** *	Left to Right conveyor movement
	R -> L	Right to Left conveyor movement
4.Conveyor Spec.	Line	If a production Line exists
	Line Return	In line, but board is returned to entrance
	Manual	Board stops at output sensor
	Manual Return	Board stops at input sensor
5. Conveyor Width	**Exist***	Auto width exists
	None	
6. Precede Pick	Exist	Precede pick sensors are available
	None	**(only VIOS >V1.xx)**
Machine config: /BUFFER CONV/		
1. Buffer Conveyor	None	No buffer conveyor
	A- Type	Buffer with external tray changer
	B- Type	stand alone buffer conveyor
2. Buffer Cnv. W axis	**None***	No buffer conveyor with "W" axis
	Normal	Front side fixed. (fixed side is door side)
	Reverse	Rear side fixed. (fixed side is door side)
Machine config: /TRAY CHANGE/		
1. Tray Changer	**None***	No tray defined
	Ext. TC - A	External - TC for 50 pallets
	Ext. TC - B	External - TC for 32 pallets
	Auto TC-A	Automatic - TC for 27 pallets
	Auto TC-B	Automatic - TC for 10 pallets
	Auto TC-C	Automatic - TC for 30 pallets
2. Ext. TC Trv. Axis	**Normal***	
	Reverse	
3. TC Access Table	**A Table***	
	B Table	
Machine config: /OPTIONS/		
1. Nozzle Changer	Exist	Nozzle change station is available
	None	
2. Slide Feeder Bar	Exist	Set to exist if this slide system is installed
	None*	
3. CoPlanarity Sensor	Exist	Do not select
	None *	No such option available yet
4. Dump Station	**None***	No dump station
	Exist	Dump station attached on the feeder plate

Parameter	Selection	Description
5. Dispense Head Exist	**None** *	Not possible for GEM systems Do not select
6. dispense head R-sensor	**Single*** Double	Not used in GEM machines
7. Dot station	Exists **Not exists***	Not applicable for GEM systems
8. RS232C extension	**None*** Exist	Is set to exist if an ext. RS232 board is installed.

10.5. ROM and File Configuration (Version Level)

The screen in fig.10.9 is showing the version of the various ROM's used in the system.

```
                          DATA[non                ]

<<<APPLICATION>>> 1/OPERATION/M  2/DATA/M  3/MAINTE/M  4/SHELL/M  0/EXIT
<<MODE>> 1/MCH_CONFIG  2/MCH_DATA  3/MCH_ADJUST 4/MANUAL  0/EXIT


   ROM TYPE                 CURRENT ROM

   HEAD-I/O-ROM
   CONVEYOR(A)-I/O-ROM
   CONVEYOR(B)-I/O-ROM
   Ext.TC-I/O-ROM
   SYSTEM-ROM
   HHK-ROM
```

Figure 10.9 ROM IC version

The screen in Fig.10.10 shows an example of the file-configuration (file version) of the system. If a file has not the correct level it will be shown in red. It is necessary that all files have the correct level to avoid problems. The screen in fig. 10.10 shows an example of the various files with their level. Depending on the VIOS version the file versions will change accordingly.

```
           DATA[non                ]
<<<APPLICATION>>> 1/OPERATION/M  2/DATA/M  3/MAINTE/M  4/SHELL/M  0/EXIT
<<MODE>> 1/MCH_CONFIG  2/MCH_DATA  3/MCH_ADJUST 4/MANUAL  0/EXIT


          FILES & DIRECTORY       REQUEST VERSION        STATUS
           MACHINE-TYPE-PATH       KG2-42T0.011\\          OK
           MESSAGE-FILE-PATH       KG2-42M0.011\\          OK
           APL-EXE.FILE            KM5-42E0-011            OK
           VISION-HEX.FILE         KG7-44D0.208            OK
           IO(OS)BIN.FILE          KG2-42S8.00A            OK
           IO(IPL)HEX.FILE         KG2-42S9.005            OK
           SEQUENCE-HEX.FILE
           DC-SERVO-HEX.FILE
           AC-SERVO-HEX.FILE       KM5-58D9.900            OK
```

Figure 10.10 File configuration

10.6. System Messages

This chapter gives a list of the system messages of the VIOS operating system. The screens below are valid for the 0.9x software and higher. In screen 4/SHELL/M - 2/DISK MAINTENANCE - sub-dir. KG7_42M0.009 a list is shown of the contents of this sub-directory (see fig.10.11). With moving the highlighted bar to a file and pressing [F8] it is possible to view the contents of this file. The most important files are displayed in bolt and are:

ERRMES_E.TXT (see fig.10.12)
HLPMES_E.TXT (see fig.10.13)
ITMMES_E.TXT (see fig.10.14)
MODMES_E.TXT (see fig.10.15)
PPERR_E.TXT (see fig.10.16)
VISMES_E.TXT (see fig.10.17)

```
                    DATA[non                ]
   <<<APPLICATION>>> 1/OPERATION/M  2/DATA/M  3/MAINTE/M  4/SHELL/M  0/EXIT
       <<MODE>> 1/DATA_FILE_MNG  2/DISK MAINTENANCE  3/VIOS_DIC  0/EXIT

 DIRECTORY C:\KG7-42M0.009              DIRECTORY C:\ECL92\KG7-42M0.009
   Name    Ext    Size     Date   Time      Name    Ext    Size     Date   Time
ERRMES_E TXT    110282 95-11-09 15:35   QWORDS_S TXT      2859 96-02-29 14:58
ERRMES_J TXT     98592 95-11-09 15:35   SBMMES_E TXT     23530 95-11-09 15:35
ERRMES_S TXT     93584 96-02-29 14:55   SBMMES_J TXT     22763 95-11-09 15:35
HLPMES_E TXT    432420 95-11-09 15:35   SBMMES_S TXT     22314 96-02-29 14:58
HLPMES_J TXT    379910 95-11-09 15:35   SPEED5   TXT       252 96-02-29 14:59
HLPMES_S TXT    337020 96-02-29 14:57   TITLE_X  TXT     47897 95-11-09 15:35
ITMMES_E TXT     33961 95-11-09 15:35   TKNSCD   TXT       177 95-11-09 15:35
ITMMES_J TXT     35227 95-11-09 15:35   TKNSYM   TXT      2235 95-11-09 15:35
ITMMES_S TXT     34076 96-02-29 14:57   UFOSBRD  TXT       297 95-11-09 15:35
LASERPOS TXT       213 96-02-29 14:57   UFOSFD2  TXT        57 95-11-09 15:35
MODMES_E TXT     17373 95-11-09 15:35   UFOSFDR  TXT       248 95-11-09 15:35
MODMES_J TXT     16734 95-11-09 15:35   UFOSMCH  TXT      1868 95-11-09 15:35
MODMES_S TXT     16639 96-02-29 14:57   UFOSVIS  TXT       816 95-11-09 15:35
```

Figure 10.11 C:\KG7-42M0.009

The *_E.TXT files contains the English text files. The *_J.TXT files contains the Japanese text files. And the *_S.TXT files contains the text files for a special language ea. French, German (if available) All these text files can only be viewed in the VIOS software.

ERRMES_E.txt:
In fig. 10.12 a small part of the Error list is shown.

```
#0000
Detection succeeded.
The corrected data is now effective.
S50xX
/0000/E
#0001
CORRECTION DATA ERROR
Only 1 Lead detected.
$5022
/0000/E
#0002
CORRECTION DATA ERROR
Correction data is not loaded.
Or it diversifies.
$5022
/0000/E
#0003
COMPONENT DETECTION ERROR
```

Figure 10.12 ERROR_E.TXT

HLPMES_E.txt:
This file contains the help messages which is shown with the [F1] key (fig.10.13)

```
#0000

 YOU CAN PUT 74 CHARACTERS PER 1 LINE, 19 LINES PER 1 PAGE.
 USE ',' AND '.' FOR INTEGRITY.
 THIS IS A TEXT FILE FOR ONLINE-HELP MESSAGES.
 IF YOU PUSH THE [F1] KEY, YOU WILL GET AN EXPLANATION
 AND PUSH ANY KEY TO CLEAR THE EXPLANATION.
 THIS MESSAGE IS NO.0
 $37
 /0000/E
 #0001
 1/OPERATION/M
           <<<OPERATION MANAGER>>>
           supports daily production.
                    MODE
 RUNNING     :Production, Warming Up         [CTRL] + [F1]
 PRD.DATA    :PCB data modification          [CTRL] + [F2]
 PRD.HISTORY :See production history        [CTRL] + [F3]
```

Figure 10.13 HLPMES_E.TXT

MOSMES_E.txt:
This file contains the text files for each mode (fig.10.14)

```
#0010
  1/OPERATION/M
  2/DATA/M
  3/MAINTE/M
  4/SHELL/M
  0/EXIT
   -------------- »    -----------------

          <<<OPERATION MANAGER>>>
         supports daily production.
                  MODE
    RUNNING    :Production, Warming Up
    PRD.DATA   :PCB data modification
    PRD.HISTORY:See production history
    MANUAL     :Manual operating
```

Figure 10.14 MODMES_E.TXT

VISMES_E.txt:
This file contains all the vision text files

```
#0000
Component was detected successfully
Position and angle data is available
$57XX
/0000/E
#0001
Component detection Error: (1)
  - Only 1 Lead detected.
$57XX
/0000/E
#0002
Calculation Error: (2)
Calibration data is not ready to read
$57XX
/0000/E
#0003
Component detection Error: (3)
Failed to detect component
```

Figure 10.17 VISMES_E.TXT

10.7. Online Commands

Online commands are used to control the Topaz from a PC.
Experiences in programming are required.
A program that makes full use of these instructions is the Philips **P**roduction **C**ontrol **S**oftware and can be ordered via regular channels.

The set of online commands will not be printed in this manual, but are available on special request at Philips Eindhoven.